# Single Aisle
# TECHNICAL TRAINING MANUAL
# T1+T2 (IAE V2500) (Lvl 2&3)
# FUEL (Metric Units)

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# FUEL (METRIC UNITS)

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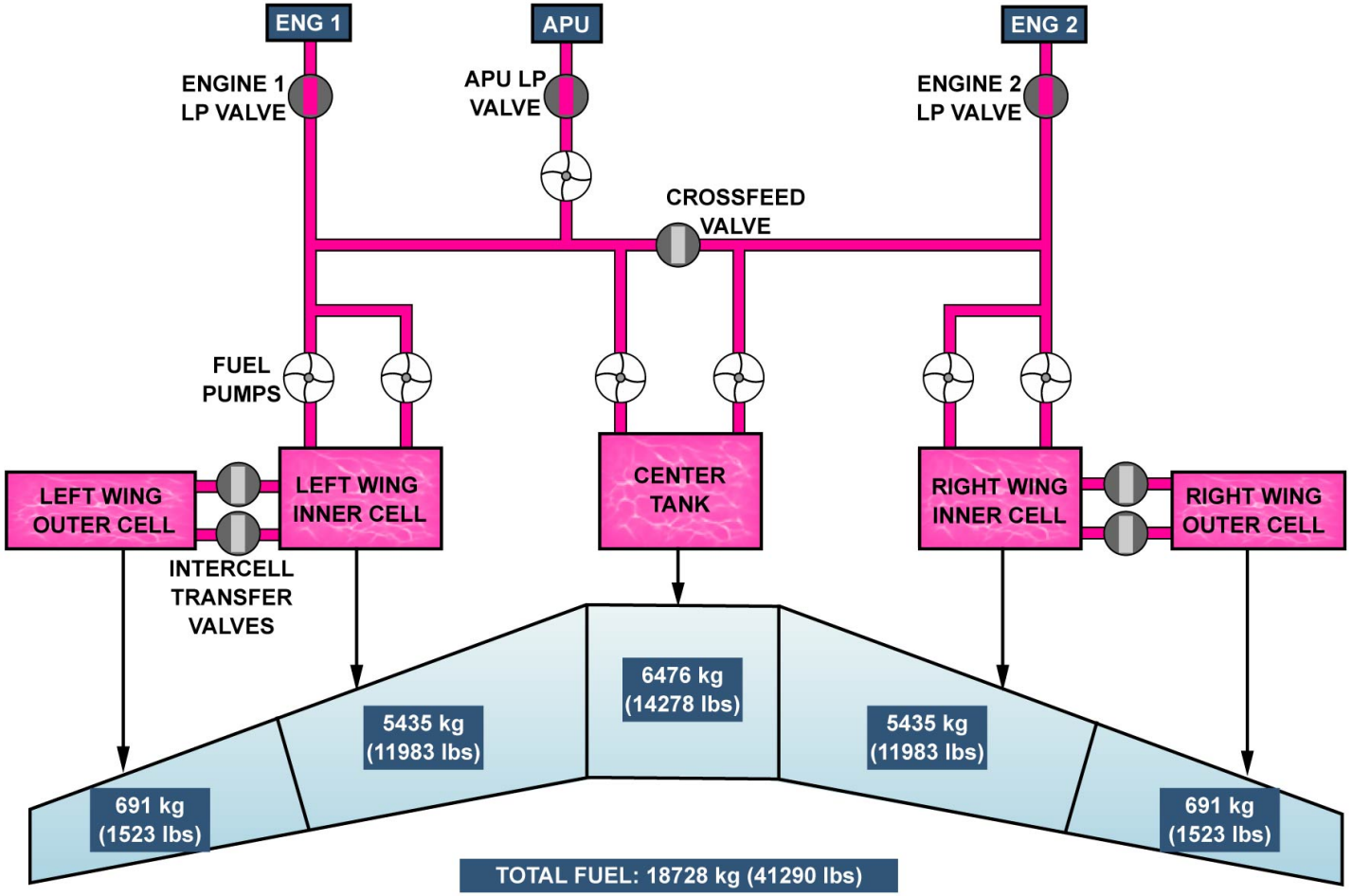
# FUEL SYSTEM COMPONENT LOCATION (2)

## SYSTEM OVERVIEW

The A318, A319 and A320 have the same fuel system design.
The fuel tanks are in the center fuselage area and the wings. The center tank is a part of the center wing box. The wing tanks are divided into inner cells and outer cells. To have less structural load on the wings, the fuel in the outer cells is not used until the fuel load in the inner cells decreases to a low level.
Two fuel pumps are installed in the center tank and two other fuel pumps are installed in each wing tank inner cell. Fuel is supplied to the engines from the center tank first. When the center tank is empty, fuel is supplied from the wing inner cells.
There is no direct feed from the outer cells to the engines. Two inter cell transfer valves are used to transfer fuel from the outer cells to the inner cells when the fuel quantity gets to the low level.
Two engine Low Pressure (LP) valves are installed to stop the fuel supply to the engines. The LP valve is closed when its related engine stops or when the FIRE pushbutton is released.
A cross feed valve is used to connect or isolate the left and right sides. With this valve, fuel can be supplied to one engine or the other from all available fuel pumps. On the ground, the cross feed valve is used to transfer fuel from tank to tank.
The fuel system also supplies fuel to the APU directly from the left side. The APU LP valve is installed to stop the fuel supply to the APU. It closes when the APU stops or when the APU FIRE pushbutton is released.




SYSTEM OVERVIEW

# FUEL SYSTEM COMPONENT LOCATION (2)

## SYSTEM OVERVIEW (continued)

### A321

The A321 fuel tanks are in the center fuselage area and the wings. Like the A318/A319/A320, the center tank is part of the center wing box but with the difference that the wing tanks are not divided. The tanks are simply known as left and right wing tanks.

Two fuel pumps are installed in each wing tank. Fuel is supplied to the engines from the wing tanks only. While the fuel level in the wing decreases, the center tank fuel is transferred to the wing tanks until the center tank is empty.

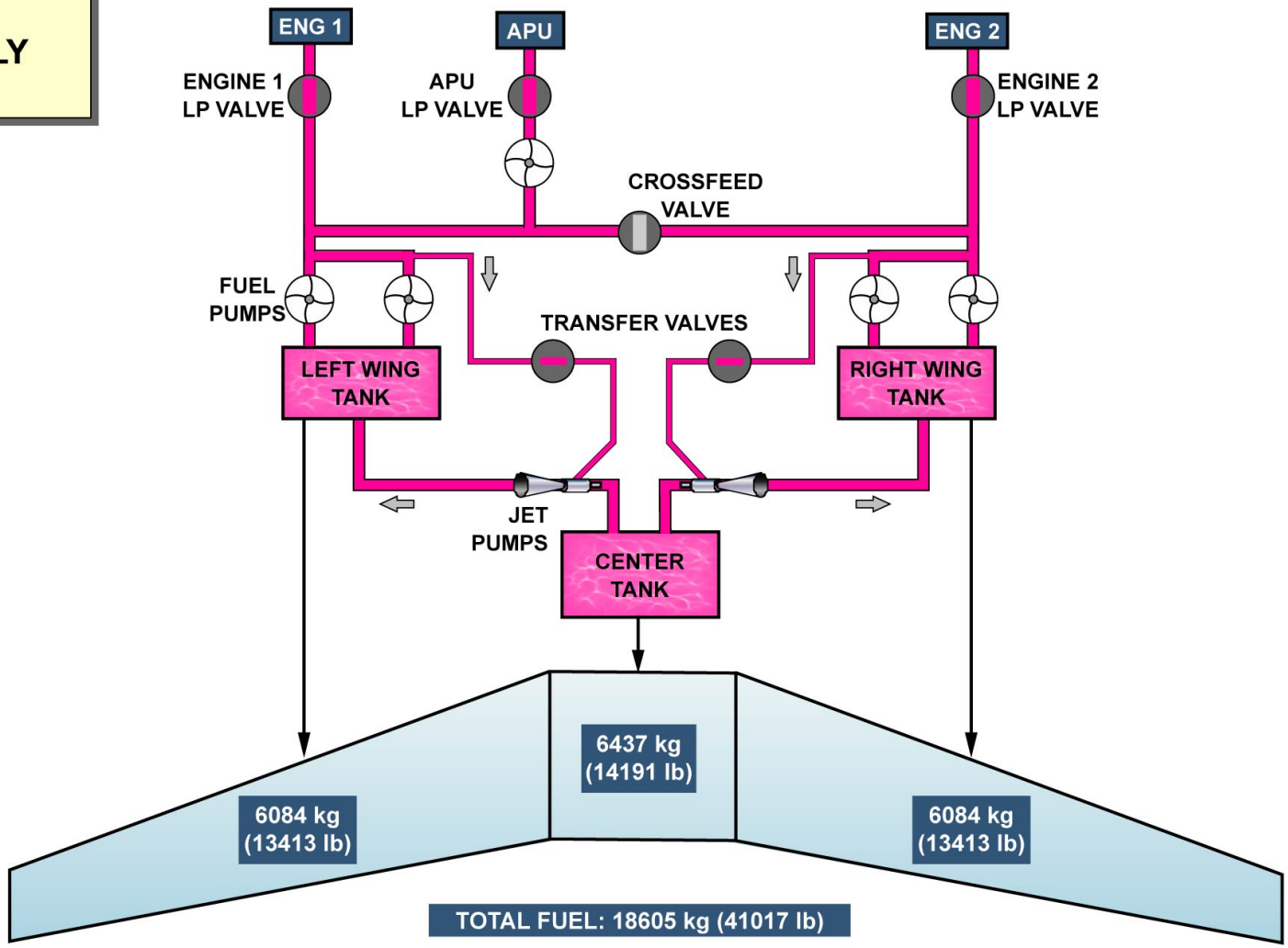
Transfer valves control the fuel transfer from the center tank to the wing tanks. The transfer valves supply pressure for two jet pumps. These pumps are installed in the center tank and they transfer the fuel from the center tank to the wing tanks.

Two engine Low Pressure (LP) valves are installed to stop the fuel supply to the engines. The LP valve is closed when its related engine stops or when the FIRE pushbutton is released.

A cross feed valve is used to connect or isolate the left and right sides. With this valve, fuel can be supplied to one engine or the other from all available fuel pumps. On the ground, the cross feed valve is used to transfer fuel from tank to tank.

The fuel system also supplies fuel to the APU directly from the left side. The APU LP valve is installed to stop the fuel supply to the APU. It closes when the APU stops or when the APU FIRE pushbutton is released.

A321 ONLY

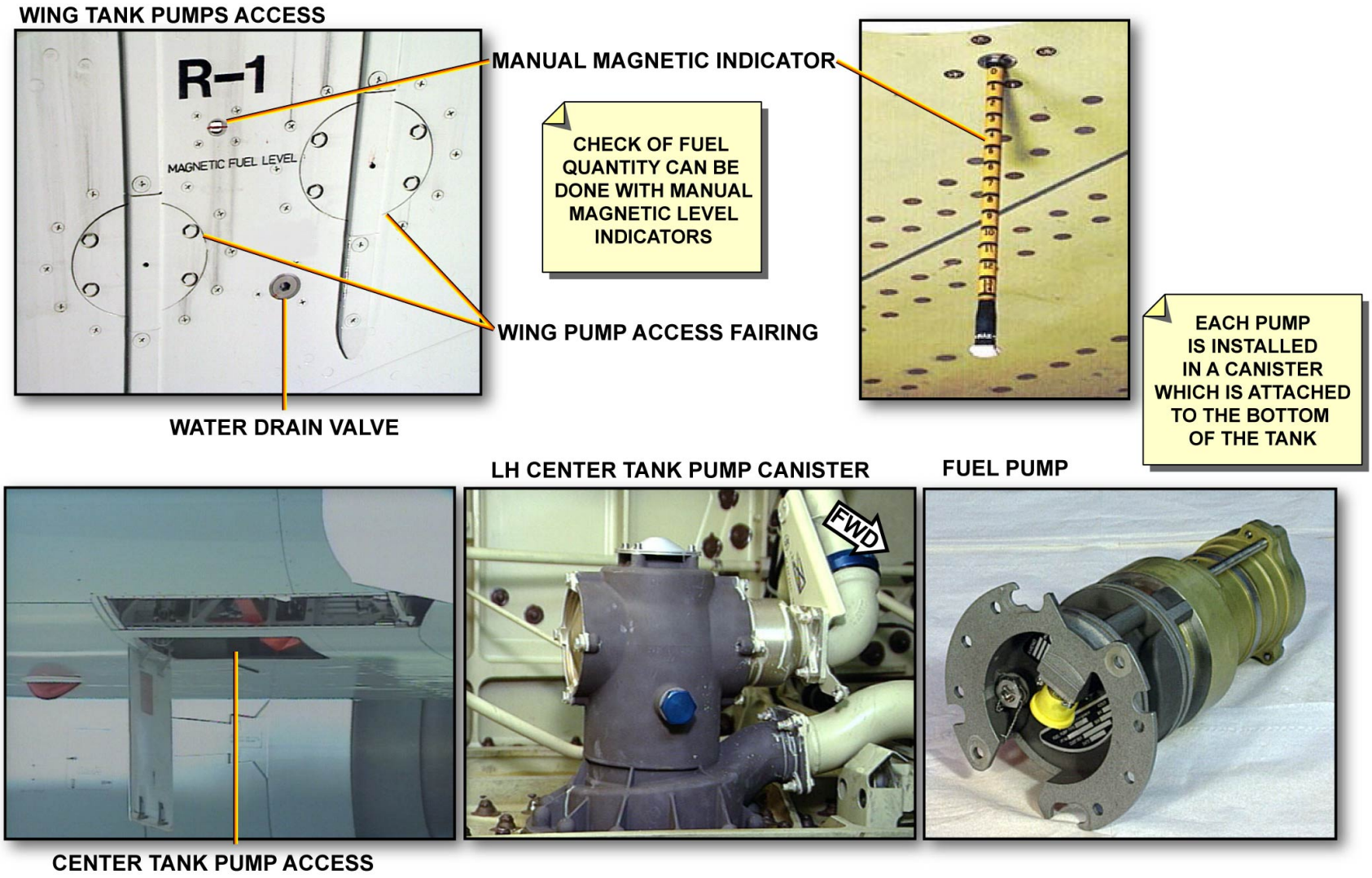



SYSTEM OVERVIEW - A321

# FUEL SYSTEM COMPONENT LOCATION (2)

## COMPONENT LOCATION

The wing fuel feed pumps are replaced from the wing lower surface. The center tank pumps are replaced through access panels in the belly fairing.
The water drain valves let you remove water, which could collect in quantities sufficient to cause malfunction to the engines.
The manual Magnetic Level Indicators are used to calculate the tank fuel quantities if a failure has an unwanted effect on the Fuel Quantity Indicating System.


WING TANK PUMPS ACCESS
R-1
MAGNETIC FUEL LEVEL
MANUAL MAGNETIC INDICATOR
CHECK OF FUEL QUANTITY CAN BE DONE WITH MANUAL MAGNETIC LEVEL INDICATORS
WING PUMP ACCESS FAIRING
WATER DRAIN VALVE
EACH PUMP IS INSTALLED IN A CANISTER WHICH IS ATTACHED TO THE BOTTOM OF THE TANK
LH CENTER TANK PUMP CANISTER
FUEL PUMP
FWD
CENTER TANK PUMP ACCESS

COMPONENT LOCATION

# FUEL SYSTEM COMPONENT LOCATION (2)

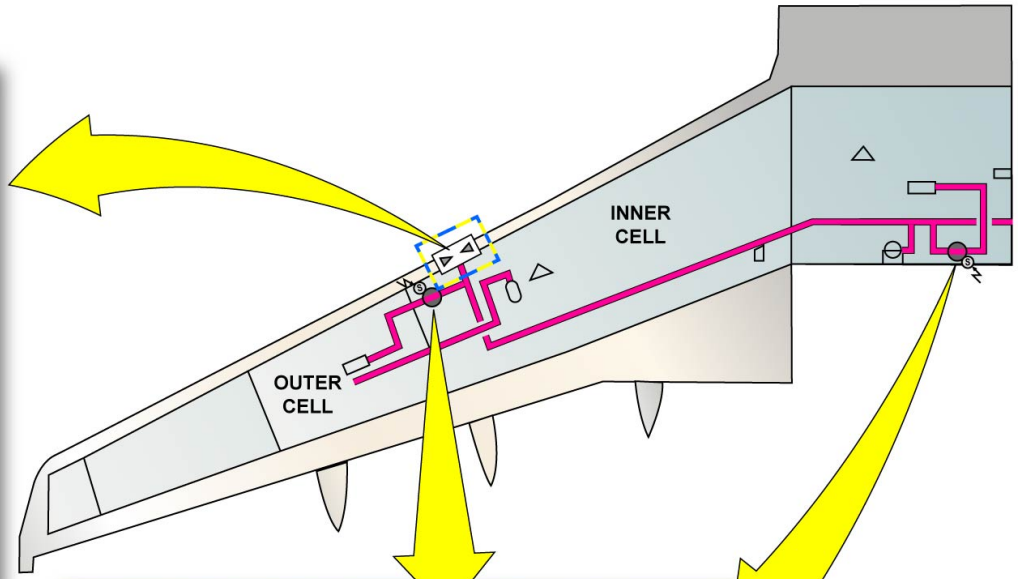
## COMPONENT LOCATION (continued)

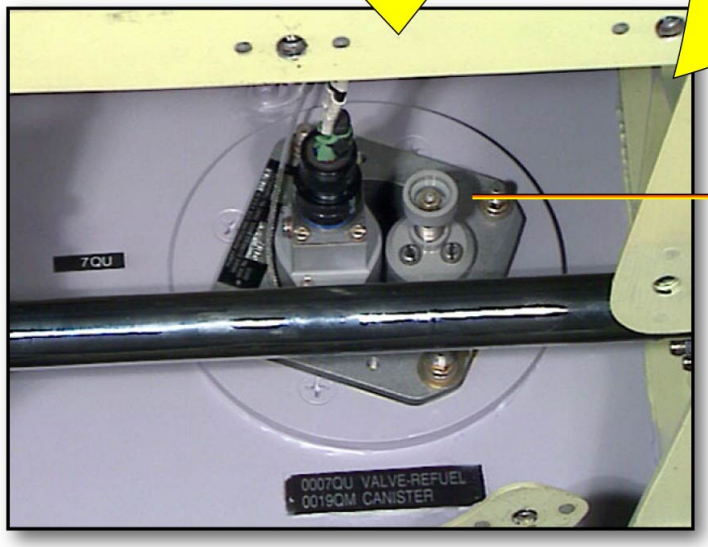
### REFUEL/DEFUEL COUPLING AND REFUEL VALVE

The Refuel/Defuel coupling is on the lower surface of the RH wing, near the leading edge. The Refuel/Defuel coupling shown is the optional one on the LH side.

There is one refuel valve on each tank. Each of the three refuel valves has a manual plunger. When pushed, the plunger holds the valve open if an electrical failure of the valve occurs during refueling.

REFUEL DEFUEL COUPLING




MANUAL PLUNGER

REFUEL VALVE

EACH REFUEL VALVE HAS A MANUAL PLUNGER TO OPERATE THE VALVE IF AN ELECTRICAL FAILURE OCCURS

OPTION

COMPONENT LOCATION - REFUEL/DEFUEL COUPLING AND REFUEL VALVE

# FUEL SYSTEM CONTROL & INDICATING (2)

**LOCATE CONTROL/INDICATING IN COCKPIT**

**FUEL FEED & TANK QUANTITY**

**FUEL LOW PRESSURE VALVES**

**REFUEL/DEFUEL PANEL**

**REFUEL/DEFUEL - TRANSFER OPERATION REVIEW**

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UGB13131 - U7ST0M0 - UM28IZLEVEL0202

# VENTING SYSTEM DESCRIPTION/OPERATION (3)

## GENERAL

The fuel tank venting system prevents overstressing of tanks.

## VENT SURGE TANK

Each vent surge tank vents to the atmosphere through a NACA type intake connected with a vent duct. Inside the vent duct there is a vent protector and a flame arrestor. The function of the vent protector is to prevent clogging of the vent duct by ice formation. The flame arrestor reduces the risk of a ground fire igniting the fuel tanks. Fuel spilled through the vent pipes into the surge tank is induced back into the outer cell by a scavenge jet pump using motive power from the wing fuel pumps. Be careful when you do work near the left-wing surge tank, there is a possible risk of asphyxiation if you put your head through the opening of the NACA duct access panel.

## WING TANK VENTING SYSTEM

Each wing tank inner and outer cell vents to the related vent surge tank. The vent lines are fitted with a vent float valve. The ducts are large enough to make sure that if the pressure refueling shut-off fails, excess fuel will be discharged overboard through the NACA intake. A rubber check valve installed in the vent line allows any fuel that finds its way into the vent lines to drain back into the related tank, where it is installed.

## CENTER TANK VENTING SYSTEM

The center tank vents into the LH vent surge tank. The center tank vent line is a conventional open line, provided with a check valve and large enough for airflow. In case of overfueling of the center tank most of the fuel flows over to the right wing tank through the relief valve.
Be careful when you do work near the center tank, there is a possible risk of asphyxiation if you put your head through the opening of the tank access panels.

## OVERPRESSURE PROTECTION

Overpressure protectors are installed in the system to relieve pressure in the tanks that might occur through vent blockage or a pressure refueling gallery failure. An excess pressure in the outer cell relieves fuel into the inner cell via an overpressure protector mounted on rib 15. An excess pressure in the inner cell or in the vent surge tank relieves fuel overboard via an overpressure protector installed on a tank access panel. The center tank overpressure protector relieves fuel into the left inner cell.

## VENT FLOAT VALVES

Two vent float valves prevent fuel from passing in the vent lines during A/C bank maneuvers. The open ends of the ducts and the vent float valves, which permit air to vent but not fuel, are positioned at the optimum levels for refueling and normal ground/flight maneuvers. A vent float valve fitted to the outer side of sealed rib 15 permits air to be vented from the outer cell to the inner cell during flight maneuvers.

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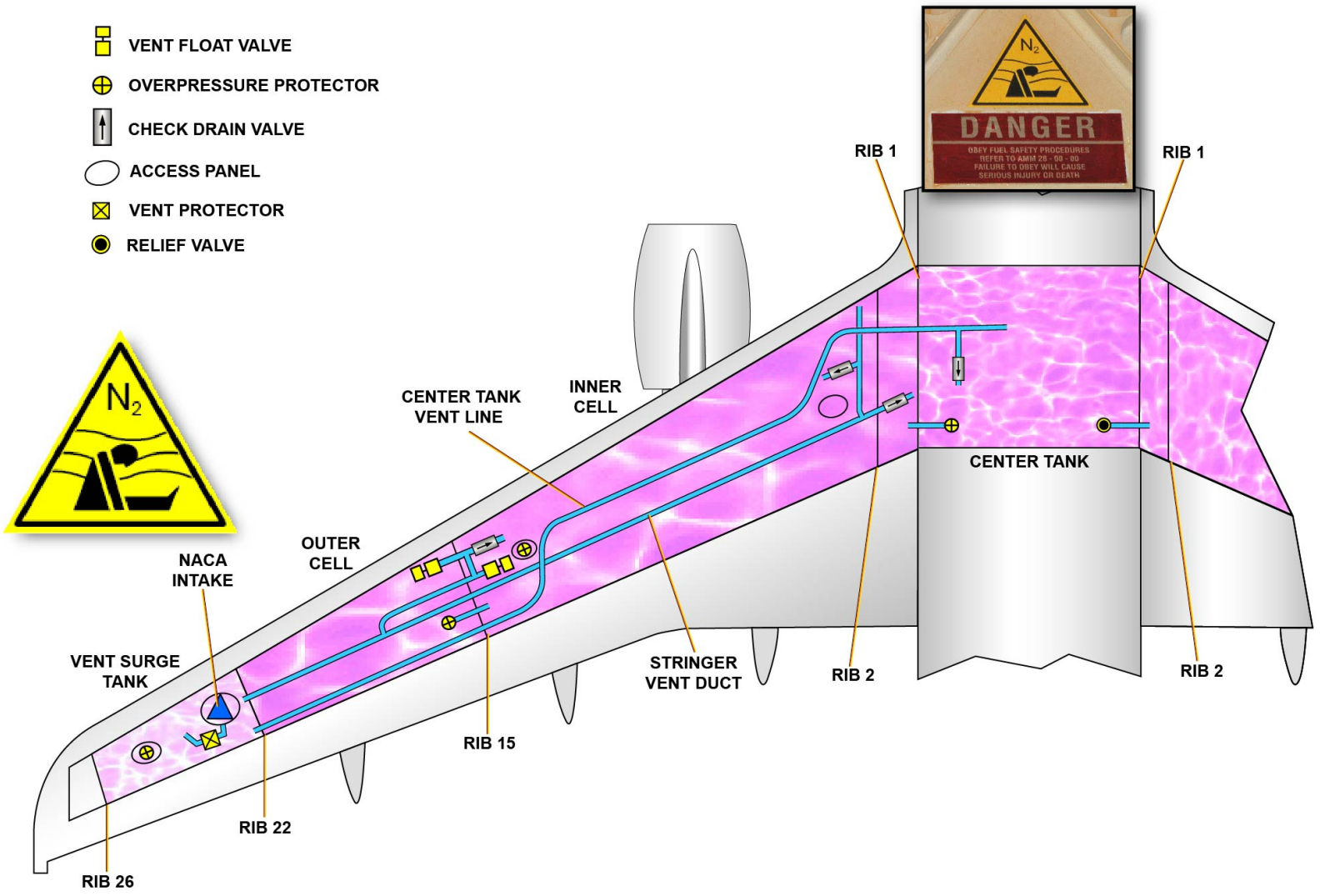


GENERAL ... VENT FLOAT VALVES

# VENTING SYSTEM DESCRIPTION/OPERATION (3)

## VAPOR SEAL

The vapor seal is a fabric membrane that isolates the Center tank from the air conditioning compartment below. Pressurized air from around the mixer unit AFT of the FWD cargo flows through the space between the vapor seal and the tank bottom to ventilate it.

## DRAIN MAST

A system of drains at the rear of the vapor seal conveys drainage and ventilating (exhaust) air through a drain mast to atmosphere. The drain mast is an aluminum fairing bolted to the underside of the fuselage. Such drain mast also receives the possible fuel leakage from the shrouded APU fuel supply line

## LEAK MONITOR

In the event of fuel flowing from the drain mast, check the leak monitor to determine the area of leakage: center tank or APU fuel supply line.

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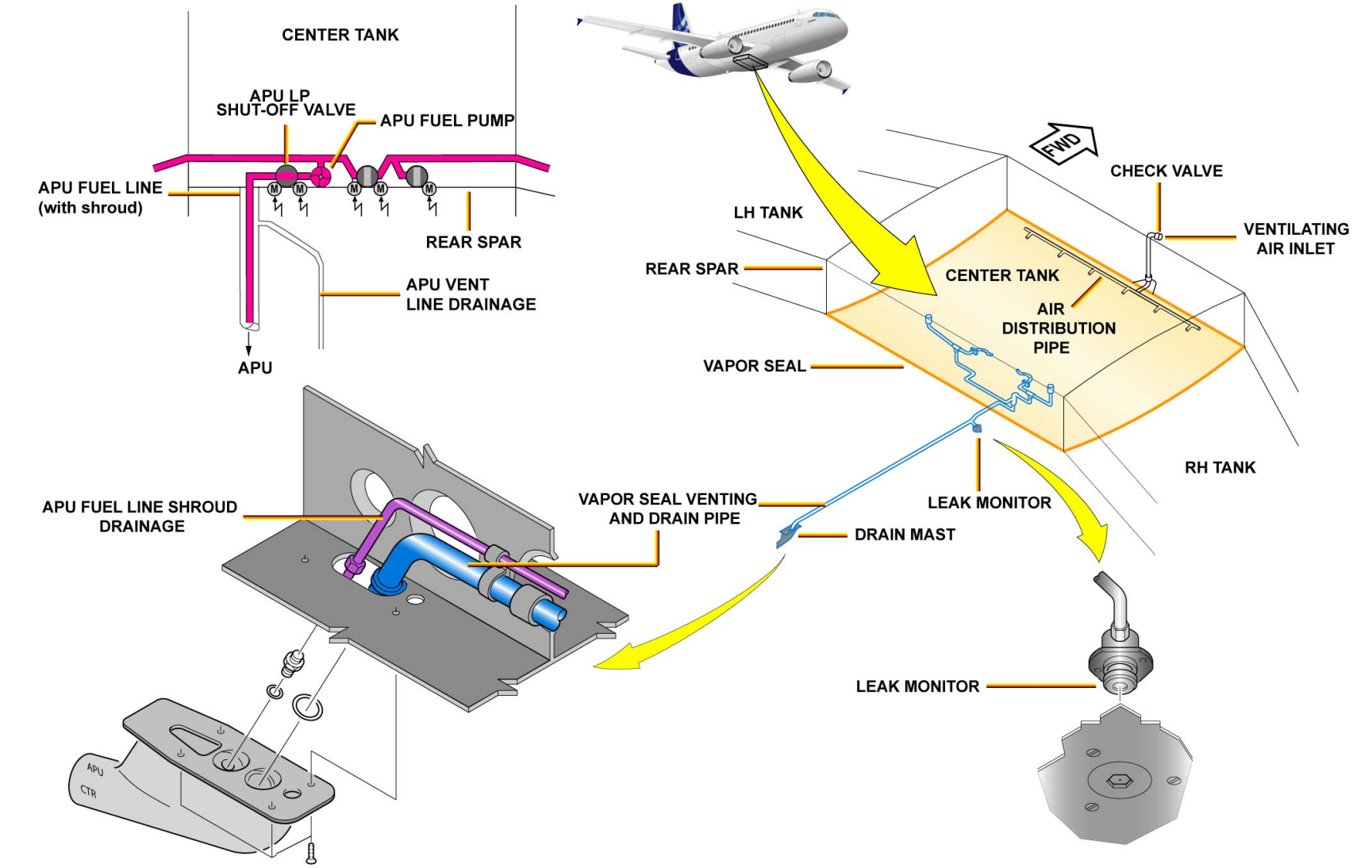


VAPOR SEAL ... LEAK MONITOR

# WATER DRAIN VALVE OPERATION (2)

## GENERAL

WARNING: DO NOT GET AIRCRAFT FUEL:
- IN YOUR MOUTH,
- IN YOUR EYES,
- ON YOUR SKIN FOR A LONG TIME.
AIRCRAFT FUEL IS POISONOUS.
DO NOT GET YOUR CLOTHES SOAKED WITH FUEL.
BEFORE YOUR REFUEL OR DEFUEL THE AIRCRAFT YOU MUST MAKE THE AREA AROUND IT SAFE. IN THE SAFETY AREA DO NOT:
- SMOKE,
- MAKE SPARKS OR FIRE,
- USE ANY EQUIPMENT WHICH IS NOT APPROVED FOR REFUEL/DEFUEL PROCEDURES.
AIRCRAFT FUEL IS FLAMMABLE.

6 water drain valves are located on the Aircraft. 4 on the wings and two on the center tank.

WARNING: YOU MUST FOLLOW THE FUEL SAFETY PROCEDURES WHEN YOU WORK ON THE FUEL SYSTEM.
PUT THE SAFETY BARRIERS IN POSITION

NOTE: Note: make sure that the fuel tanks are filled to a minimum of 10 % of Capacity. This is necessary to cover the water drain valve outlet, so that the water drain valves can operate satisfactorily.

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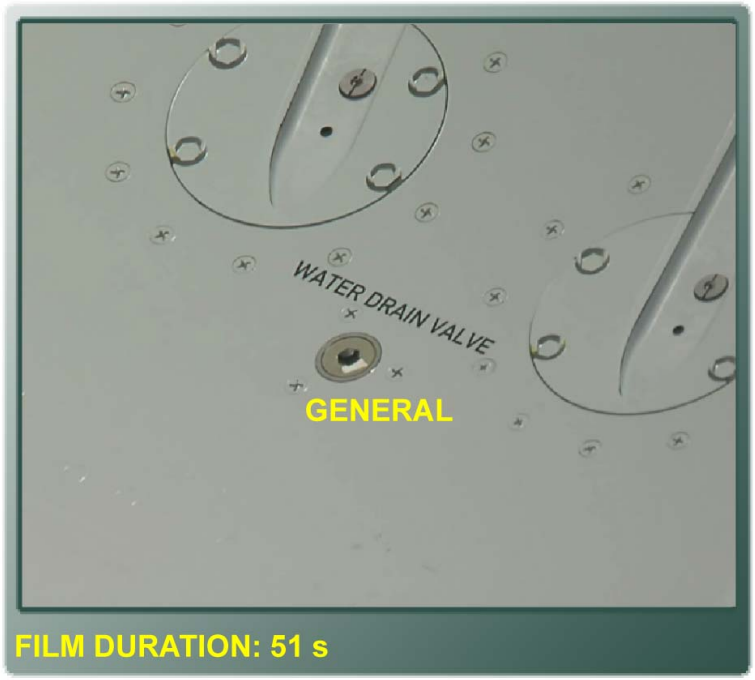
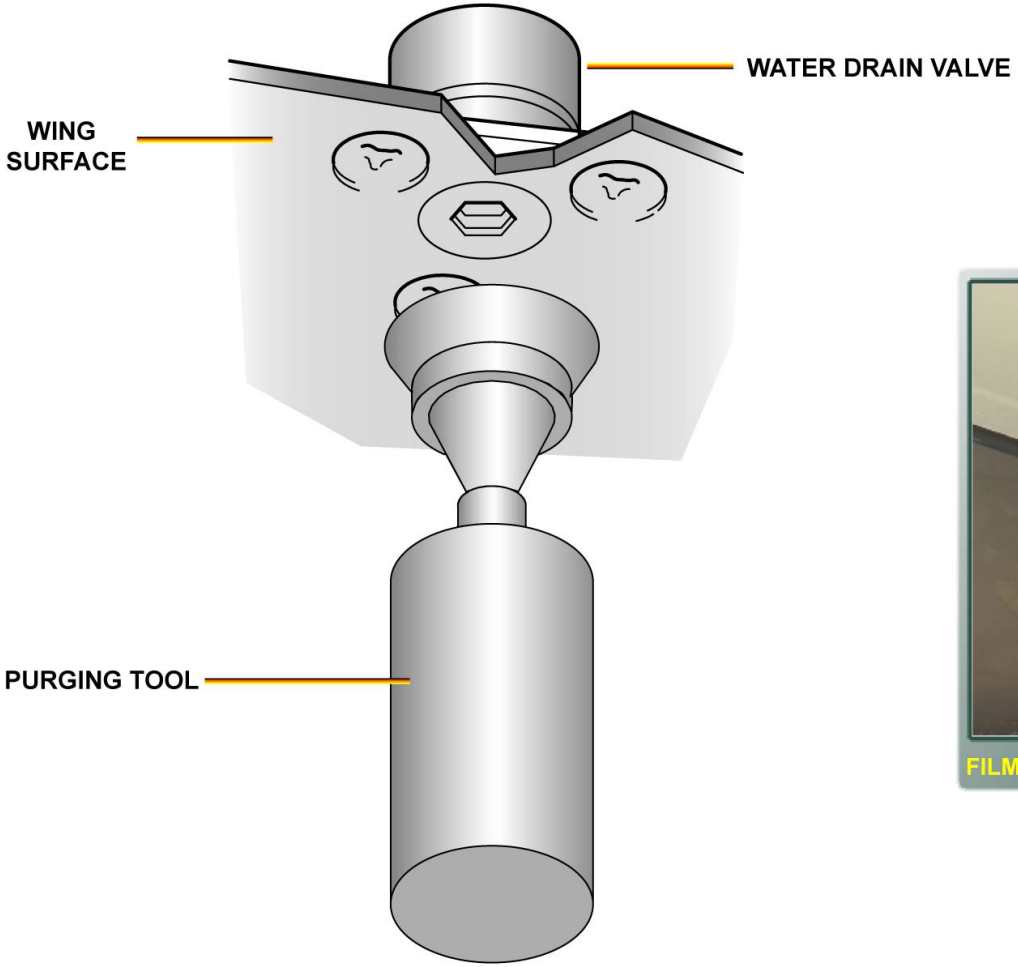


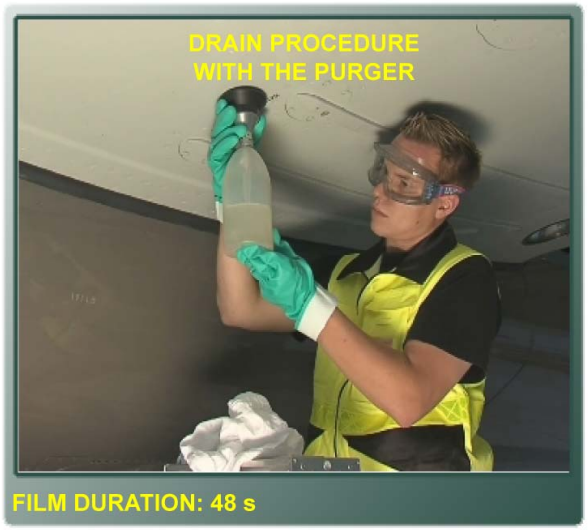

GENERAL

# WATER DRAIN VALVE OPERATION (2)

## DRAIN PROCEDURE WITH THE PURGER

A - Push the center of the applicable water drain valve with the Purger.
B - Remove the Purger from the water drain valve and clean the Area.
C - Do the water Contamination test.
D - Pull the Fuel from the Sample in the injection.
E - When the colour stays yellow, there is no water in the test.
F - Test with water.
G - The colour from the test goes from yellow to blue.




DRAIN PROCEDURE WITH THE PURGER

# WATER DRAIN VALVE OPERATION (2)

## DRAIN PROCEDURE WITH THE TEST EQUIPMENT JET PUMP

A - hold the bush and turn the screw to the end of its travel. This causes the plunger to open the drain valve and the fuel to flow.
B - when the fuel flow stops, remove the TEST EQUIPMENT JET PUMP.
C - remove all the ground support equipment, the maintenance equipment, the standard and special tools and all other items.
D - make sure that the work area is clean and clear of tools and other items.

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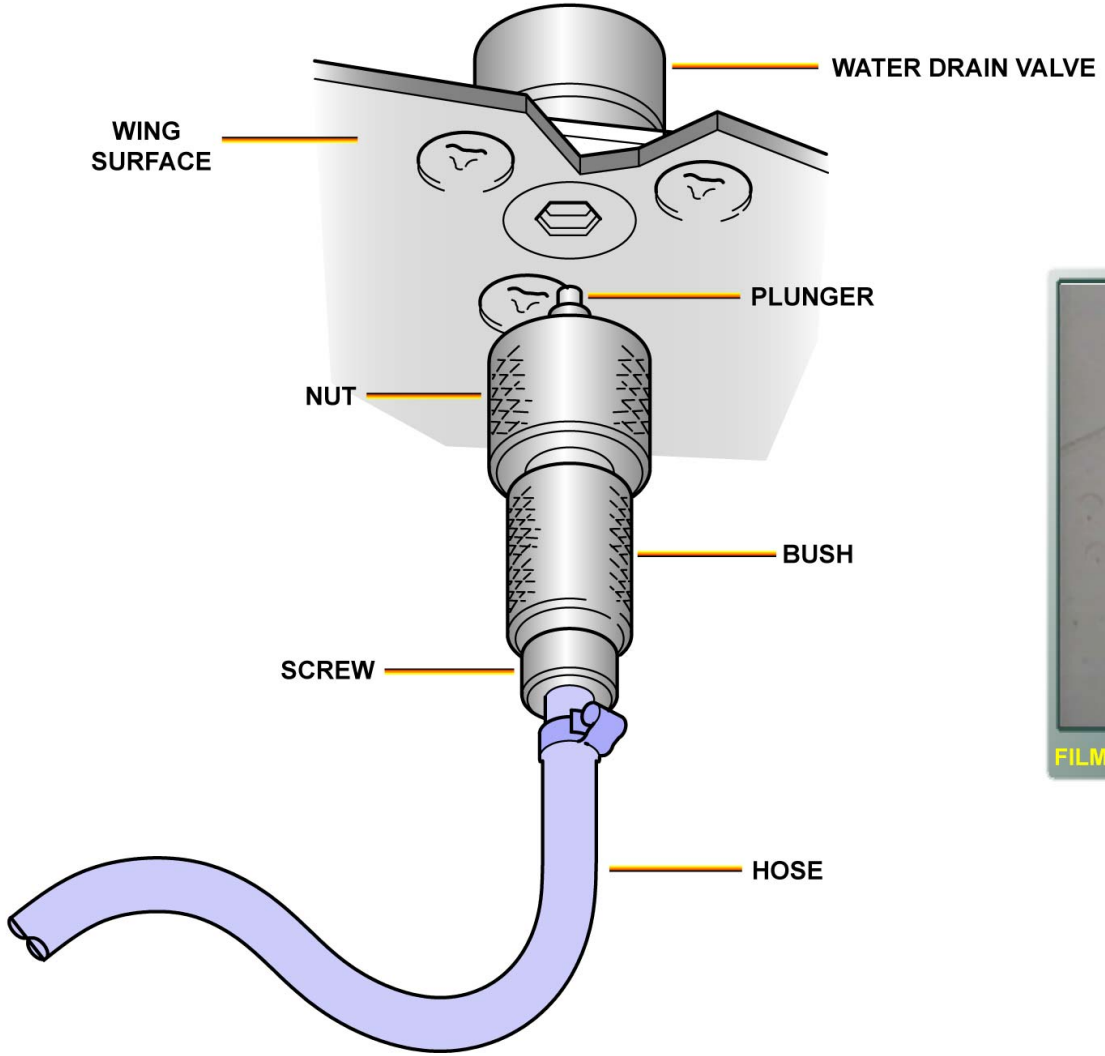


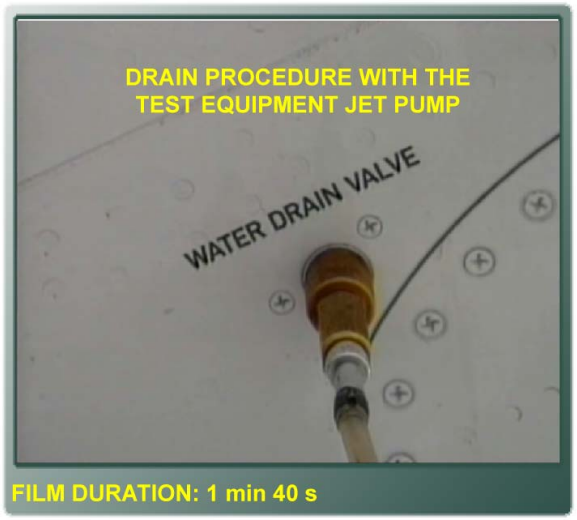


DRAIN PROCEDURE WITH THE TEST EQUIPMENT JET PUMP

# ENGINE FEED SYSTEM D/O (3)

## GENERAL

The main fuel pump system supplies fuel from the fuel tanks to the engines. Each tank has two centrifugal booster pumps.

### CROSSFEED VALVE

The crossfeed valve divides the engine fuel feed system into two independent systems.
The valve is located in the center tank and is usually in the closed position. In this position, it divides the main fuel pump system into two parts, one part for each engine. When the crossfeed valve is open, either tank can supply fuel to either engine. The valve is electrically controlled and operated by two DC motors.

### MAIN FUEL PUMPS

The main pumps are driven by a 3-phase 115V AC motor. The two pumps in each tank are supplied by different electrical power supply bus bars. When it is in operation, each main pump may supply fuel to:
- its related engine,
- the fuel recirculation cooling system,
- the crossfeed system,
- the refuel/defuel system.

### FUEL PUMP CANISTER

The canister lets you replace the fuel pump without draining fuel. The fuel pump element is located in a canister attached to the bottom skin of the wing or the centre wing box, with an inlet connected to a fuel strainer.
The canister has different outlets:
- one upper outlet is connected to the engine feed line and contains an internal flap-type check valve,
- the other upper outlet is connected to a sequence valve (for wing tank pumps only),
- a smaller outlet is connected to the scavenge jet pumps and the fuel pump pressure switch.

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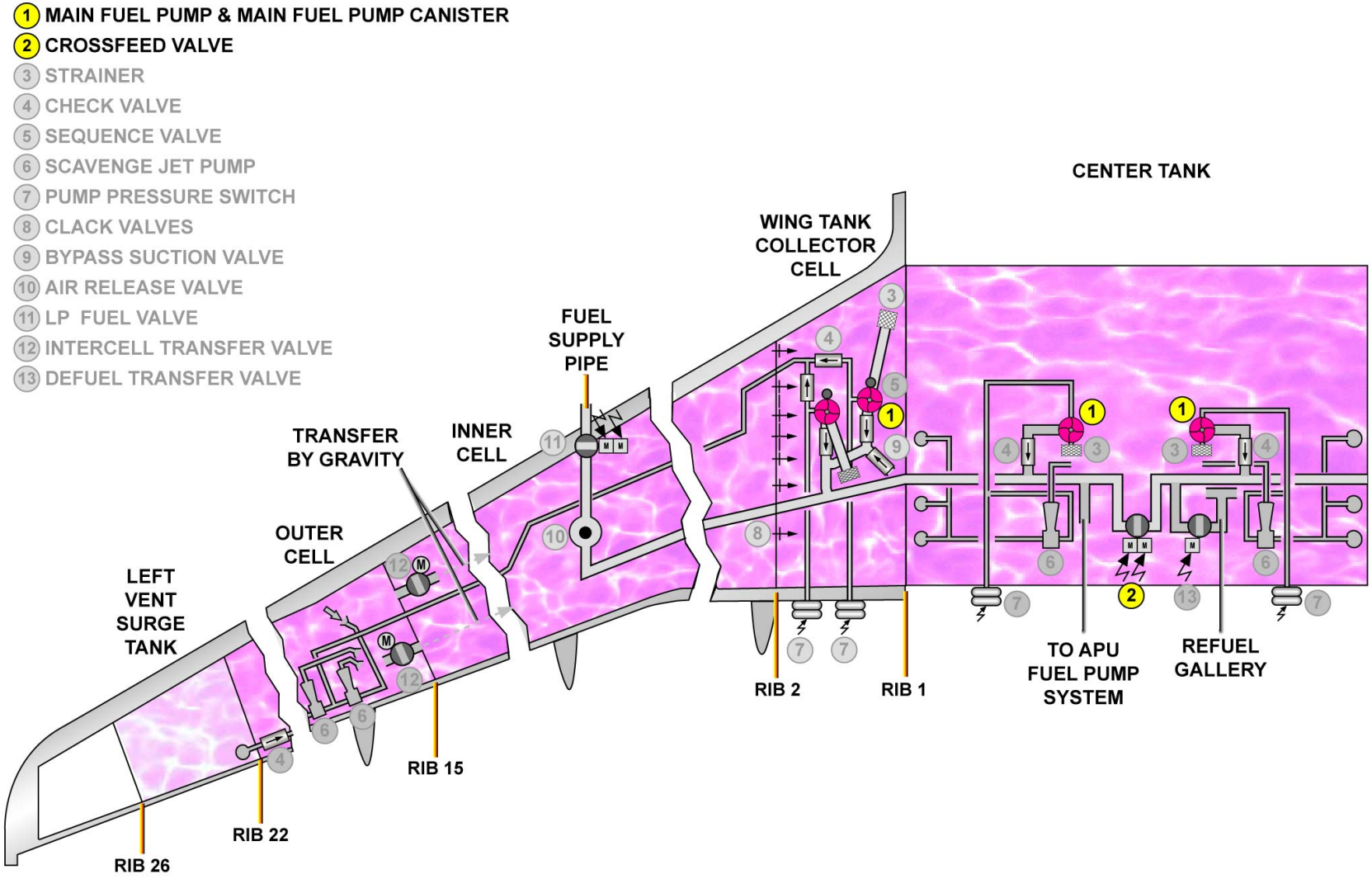


GENERAL - CROSSFEED VALVE ... FUEL PUMP CANISTER

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# ENGINE FEED SYSTEM D/O (3)

## CENTER TANK PUMP OPERATION

Whenever the center tank pumps run, as controlled by A/C logic, the center tank supplies the feeding fuel to the engines.
When a fuel pump is not in operation, the check valves prevent any reverse flow of fuel through the pump. The center fuel pump element is located in a canister attached to the center tank bottom skin, with a lower inlet connected to a fuel strainer.

### AIR RELEASE VALVE

The air release valve releases air, trapped in the engine fuel feed line, into the wing tank. The air release valve is installed at the highest point between the pump and the LP fuel valve.

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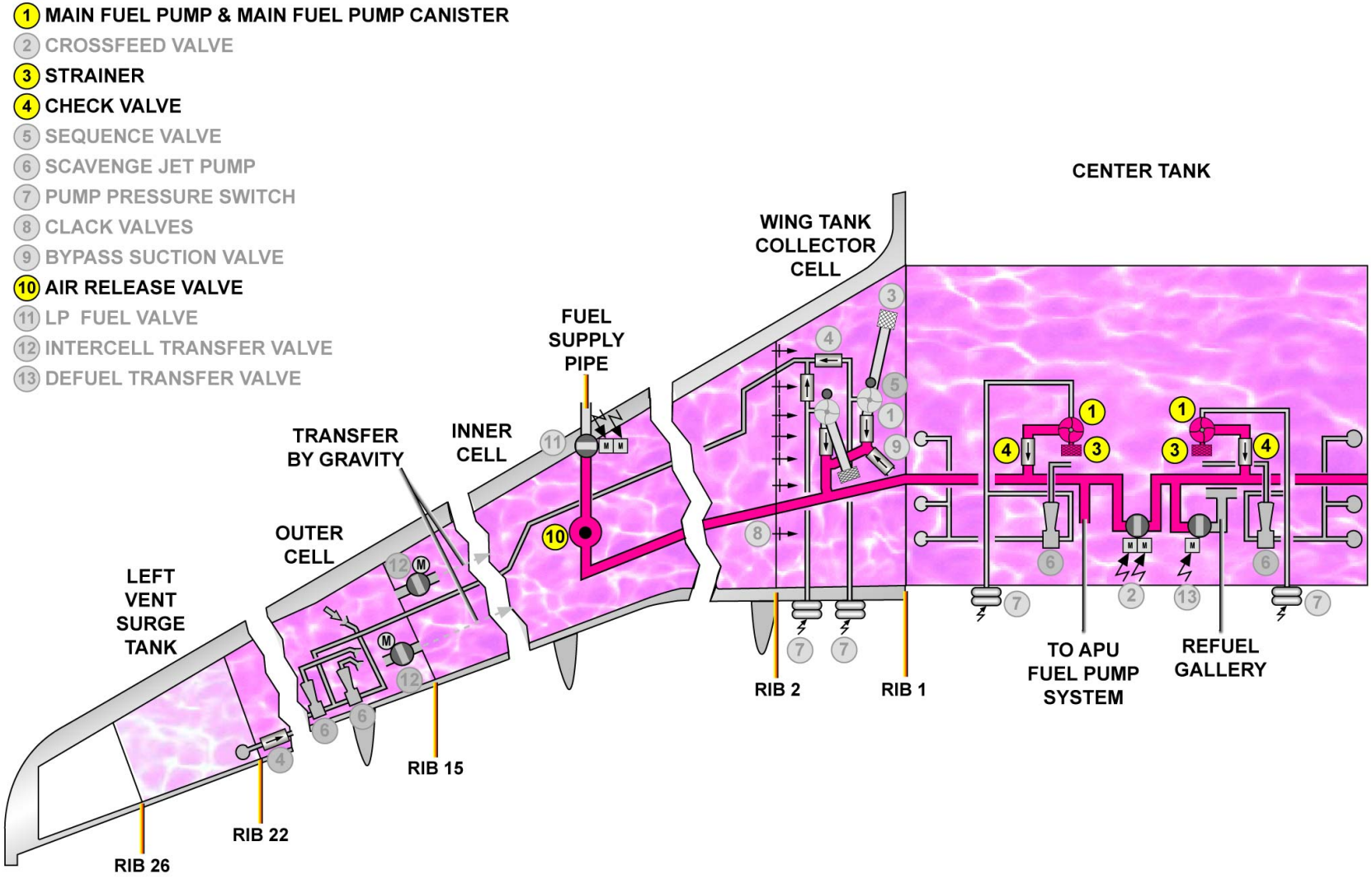


CENTER TANK PUMP OPERATION - AIR RELEASE VALVE

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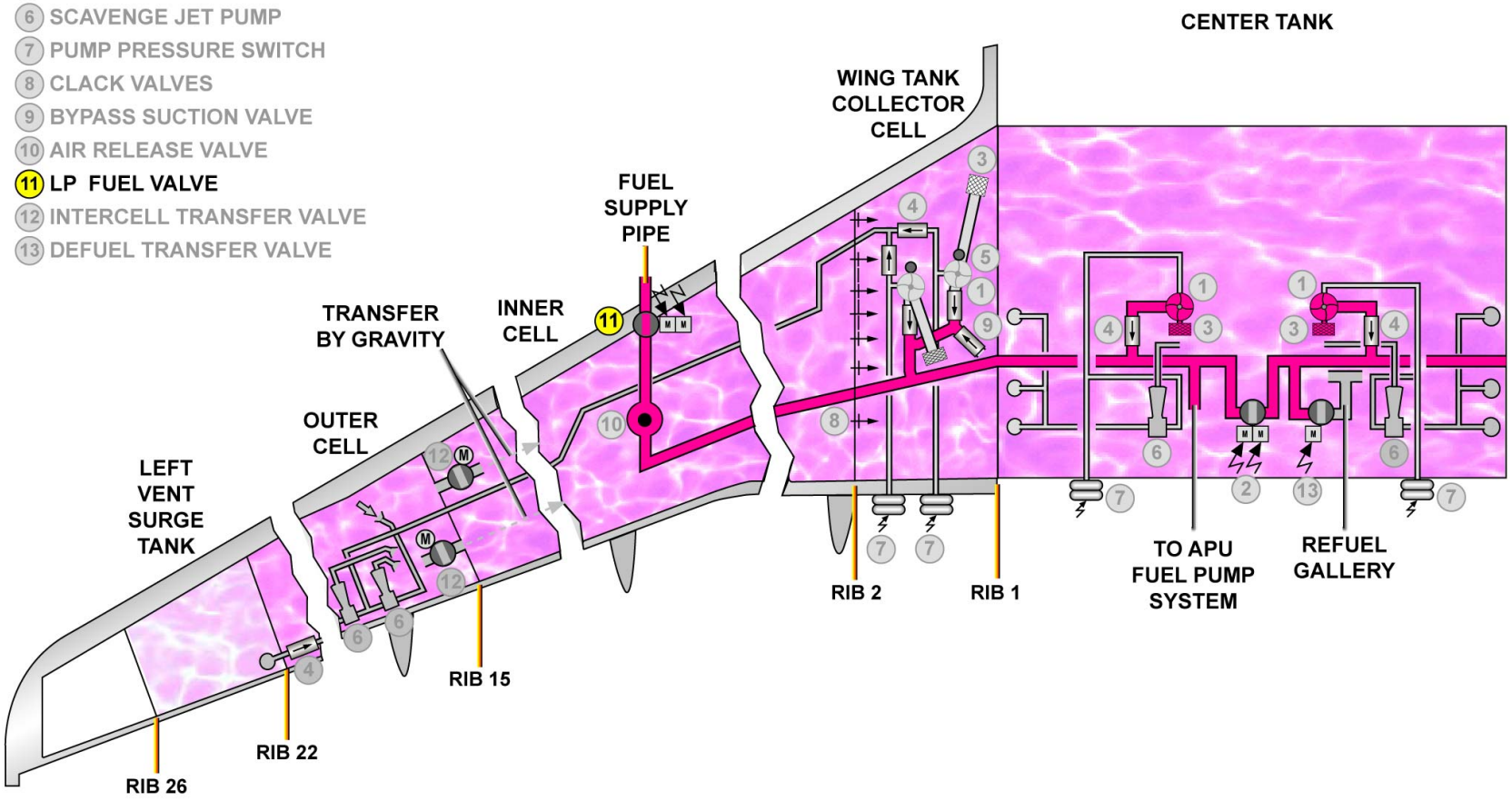
# ENGINE FEED SYSTEM D/O (3)

## LOW PRESSURE (LP) FUEL VALVE

The LP fuel valve is installed on the wing tank front spar, in the feed line to the engine. Each LP fuel valve has an actuator with 2 electric motors. Each one of them is supplied by different 28 V DC power sources. The LP fuel valve isolates the engine fuel feed supply at engine shutdown, i.e. normal procedure, or in case of emergency, i.e. engine fire procedure.

1 MAIN FUEL PUMP & MAIN FUEL PUMP CANISTER
2 CROSSFEED VALVE
3 STRAINER
4 CHECK VALVE
5 SEQUENCE VALVE
6 SCAVENGE JET PUMP
7 PUMP PRESSURE SWITCH
8 CLACK VALVES
9 BYPASS SUCTION VALVE
10 AIR RELEASE VALVE
11 LP FUEL VALVE
12 INTERCELL TRANSFER VALVE
13 DEFUEL TRANSFER VALVE




LOW PRESSURE (LP) FUEL VALVE

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# ENGINE FEED SYSTEM D/O (3)

## SCAVENGE JET PUMP OPERATION

The scavenge jet pump has:
a jet pump body
a jet adaptor assembly
The jet pump body fully contains the jet adaptor assembly. The jet pump body has a flange at one end for the installation to the tank structure. The jet pump body has also three threaded openings:
Z is the outlet form the jet pump
Y is the inlet from the fuel tank
X is the inlet from the related fuel pump
The jet adaptor assembly has:
a non-return valve (NRV)
a jet nozzle
The NRV has a spring and a valve assembly. If the related pump is set to off, the spring closes the NRV. Thus fuel cannot enter the fuel pump that is set to off.

### OPERATION

When the related fuel pump is on, fuel goes into the jet pump through the inlet X. The fuel flows through the NRV and the jet nozzle. The jet nozzle decreases the pressure and increases the velocity of the fuel that goes through. This causes a suction force at the inlet Y that is connected to a pipe system and therefore connected to the lowest part of the tank. The fuel at the inlet Y is moved through the jet pump, mixed with the fuel from the inlet X and distributed through the outlet Z.

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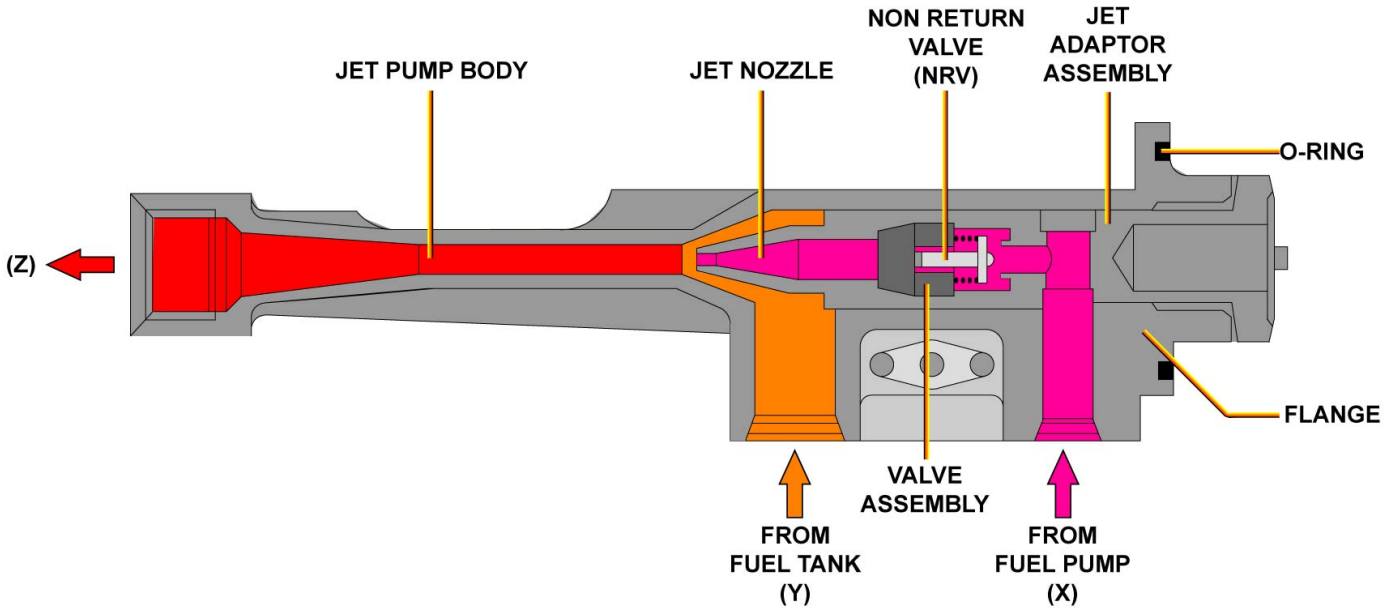


SCAVENGE JET PUMP OPERATION - OPERATION

# ENGINE FEED SYSTEM D/O (3)

## CENTER TANK PUMP PRESSURE SWITCHES

The pressure switches monitor the output of the pumps through a pressure pipe. If the pressure from the center tank pump decreases to less than 6 psi (0.41 bars) the pressure switch sends a warning signal to the ECAM system. Fuel is first supplied by the center tank pumps and then by the wing tank pumps when the center tank is empty.
Center tank scavenge jet pumps move fuel and water caught in the tank to the related main pump inlet.

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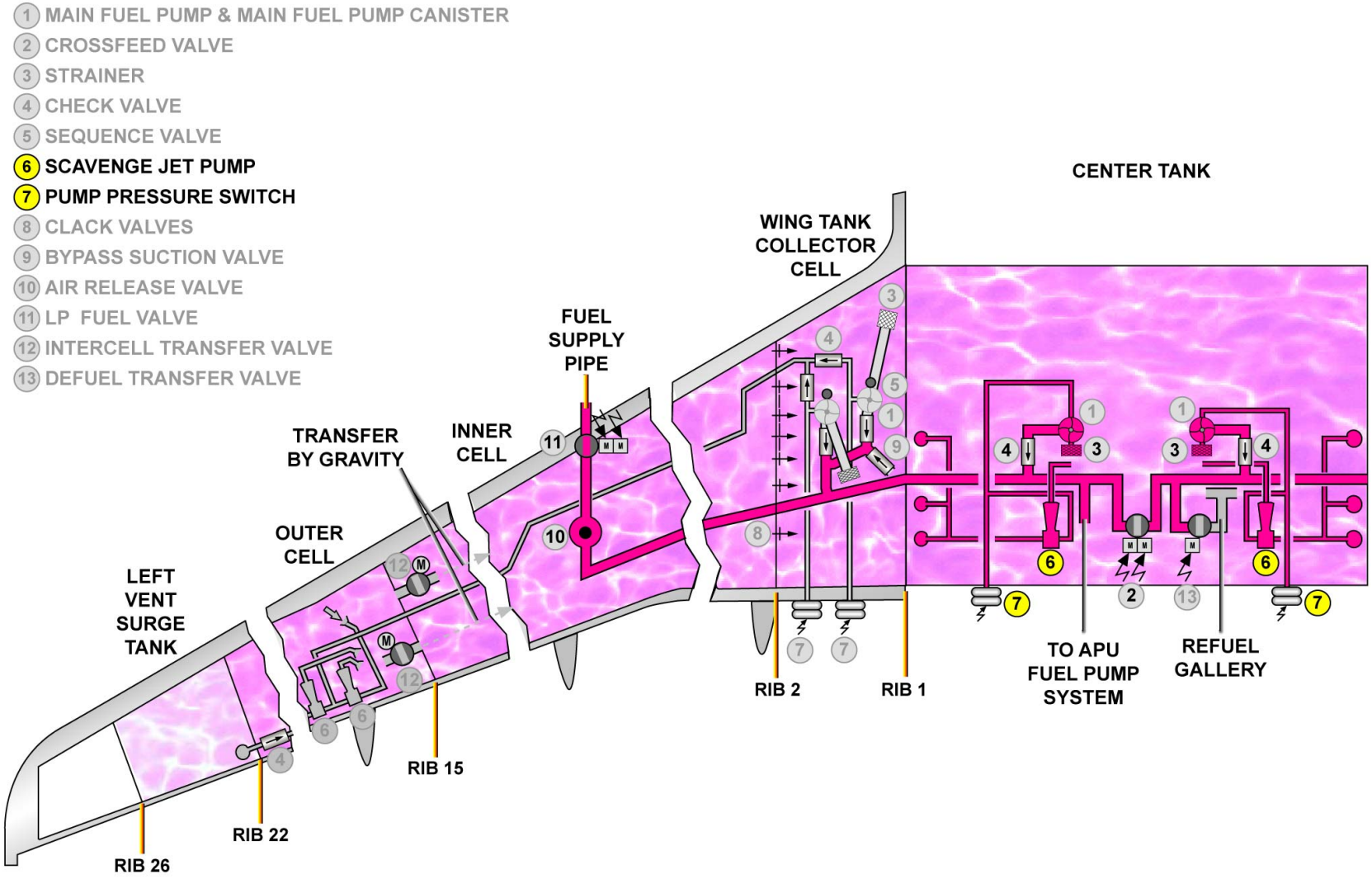


CENTER TANK PUMP PRESSURE SWITCHES

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# ENGINE FEED SYSTEM D/O (3)

## WING TANK PUMP OPERATION AND SEQUENCE VALVES

When all the tanks contain fuel, the center tank is emptied first. The wing tank pumps have a sequence valve to make sure that the center tank is emptied first. The sequence valve acts as a relief valve and keeps the output pressure of a wing tank pump 5 psi lower than that of the center tank pump.

The pumps in each wing tank are located in the lowest area of the inner cell in a collector cell. Seven clack valves at the bottom of rib 2 allow the fuel to flow into the collector cell but prevent the fuel from flowing back during wing down manoeuvres of the aircraft. Thereby the fuel pumps are sufficiently immersed in fuel even if the fuel level in the tank is low.

Each wing tank collector cell has:

- two fuel pumps contained in their related canisters,
- two fuel strainers,
- a suction valve,
- two check valves.

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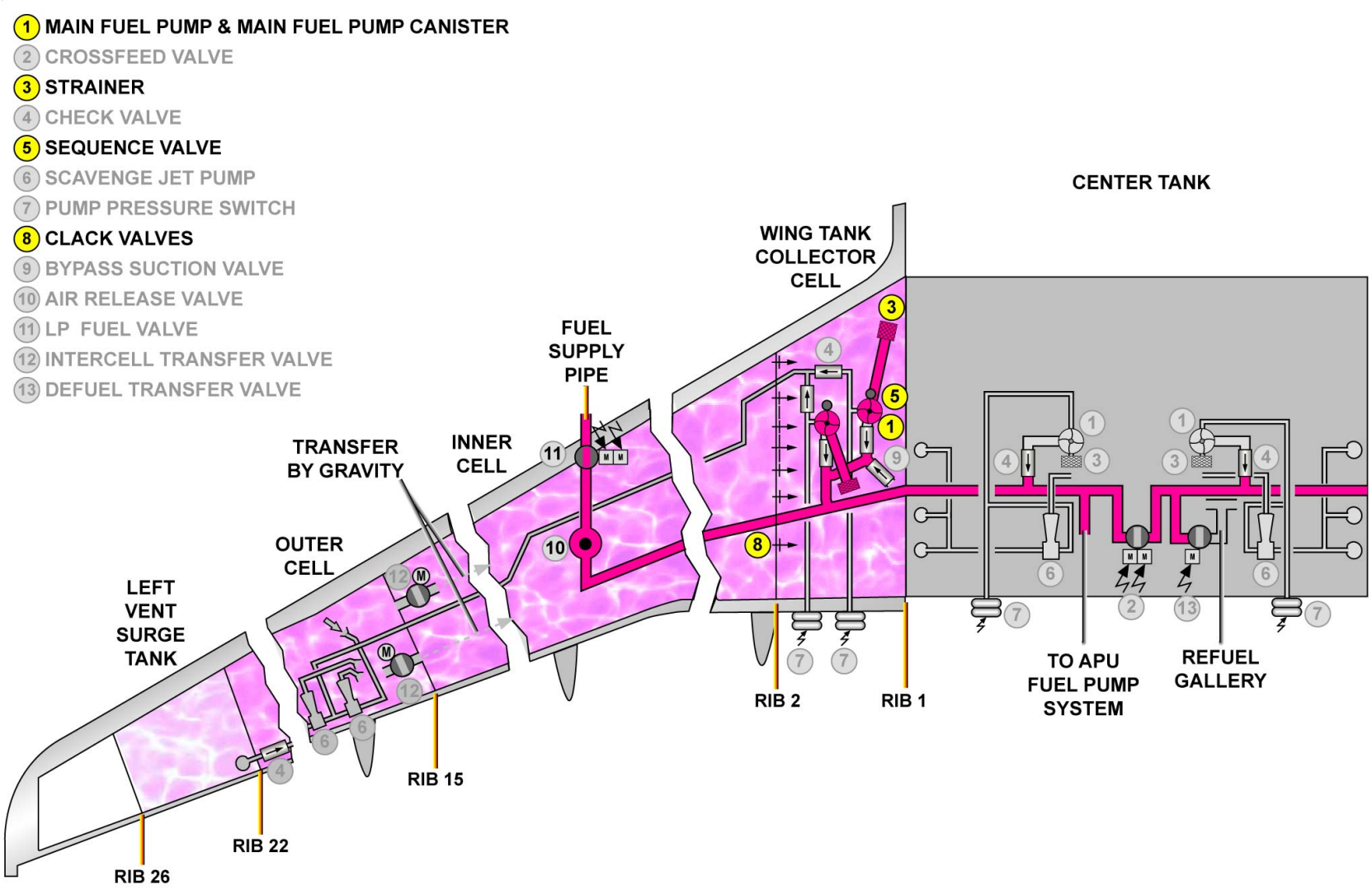


WING TANK PUMP OPERATION AND SEQUENCE VALVES

UGB13131 - U7ST0M0 - UM28D2000000001

# ENGINE FEED SYSTEM D/O (3)

## WING TANK PUMP PRESSURE SWITCHES/BYPASS SUCTION VALVE

The pressure switches monitor the output of the pumps through a pressure pipe. If the pressure from the main pump decreases to less than 6 psi (0.41 bars) the pressure switch sends a warning signal to the ECAM system.

### BYPASS SUCTION VALVE

A bypass suction valve is installed on the engine feed line, downstream of the main pumps. If both wing tank pumps fail with no center tank pump running and the crossfeed valve closed, the bypass suction valve lets fuel be sucked from the wing tank by the engine fuel pump system and thus engine supply is done by "gravity".

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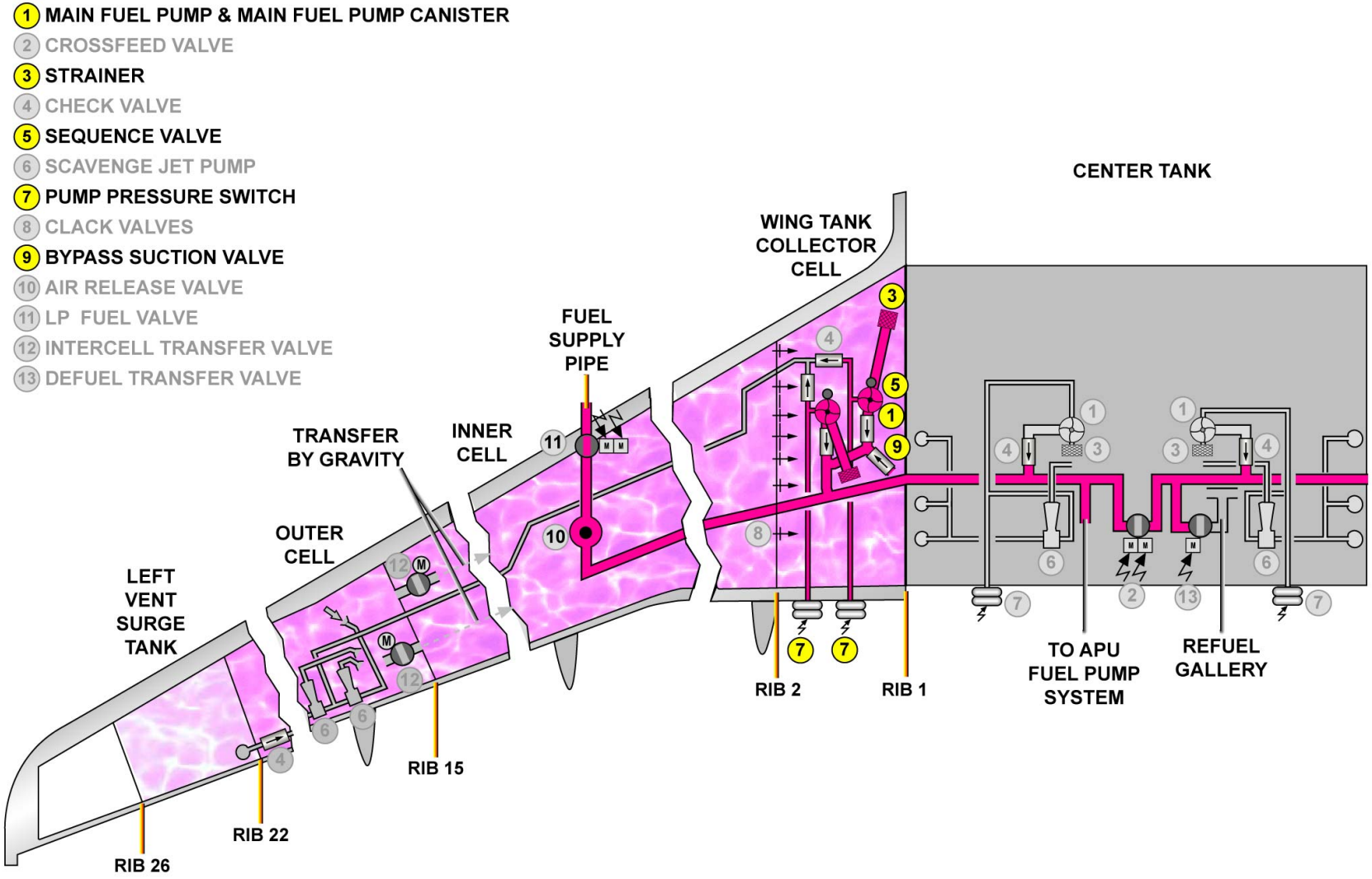


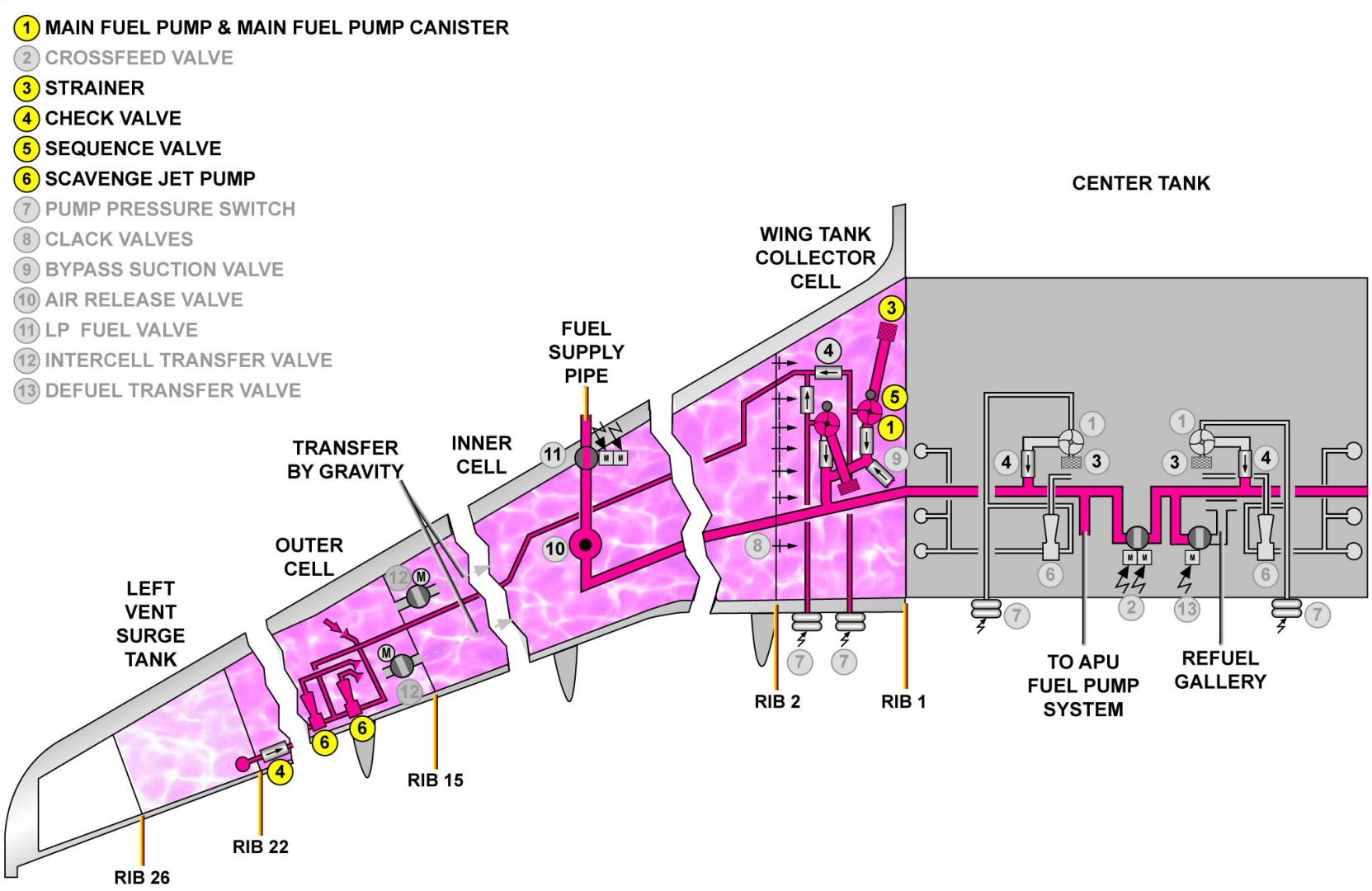

WING TANK PUMP PRESSURE SWITCHES/BYPASS SUCTION VALVE - BYPASS SUCTION VALVE

UGB13131 - U7ST0M0 - UM28D2000000001

# ENGINE FEED SYSTEM D/O (3)

## WING SCAVENGE JET PUMPS

One of the two scavenge jet pumps in the outer cells removes fuel out of the vent surge tank to the rear intercell transfer valve. A Check valve, in the line between the vent surge tank, combined with this jet pump, makes sure that fuel cannot enter the vent surge tank via the pump if the wing tank pumps are off. The other scavenge jet pump mixes fuel and water within the outer cell.
Each scavenge jet pump receives its motive fuel pressure from the wing tank pumps, if running.




WING SCAVENGE JET PUMPS

UGB13131 - U7ST0M0 - UM28D2000000001

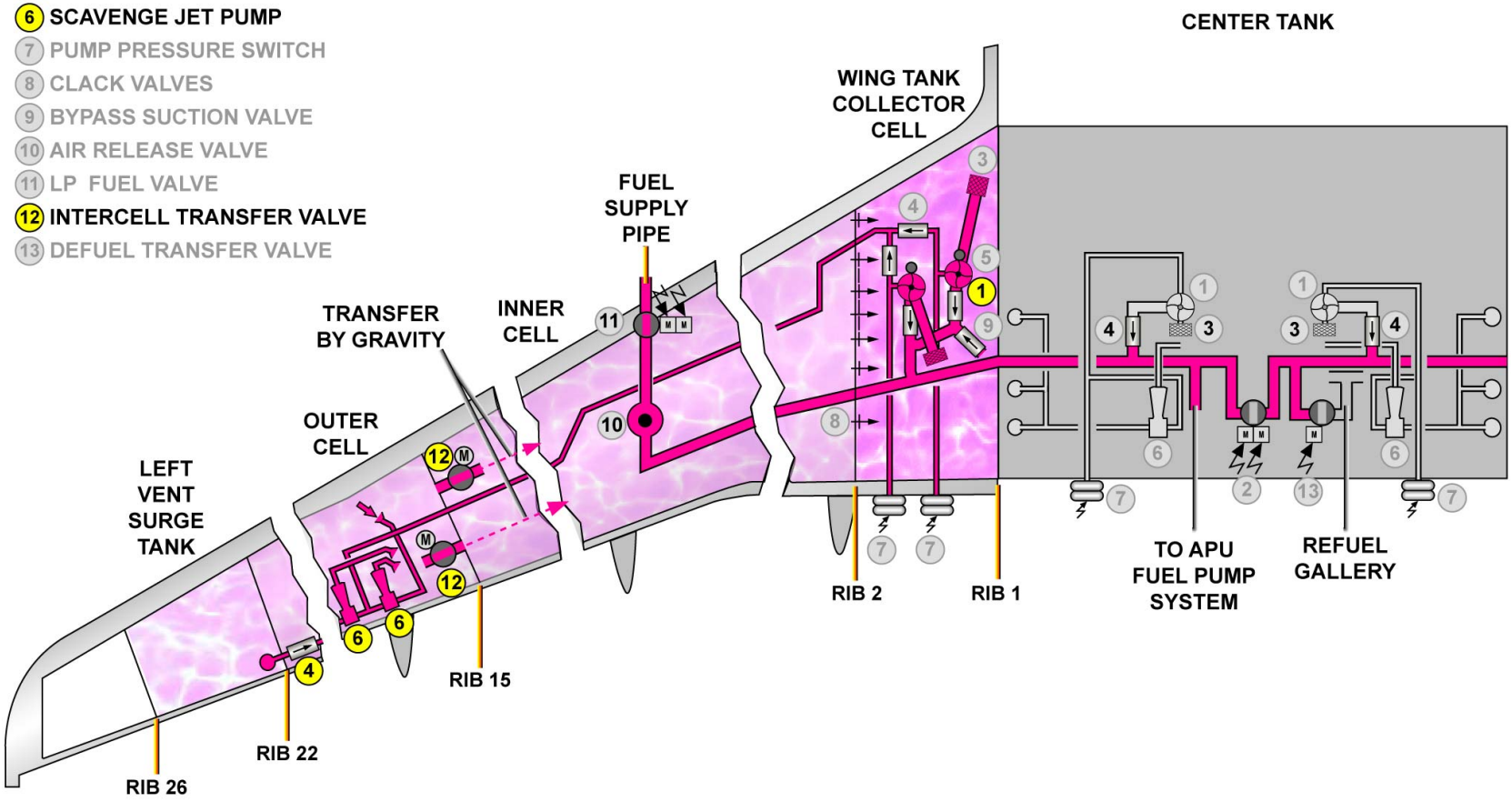
# ENGINE FEED SYSTEM D/O (3)

## INTERCELL TRANSFER VALVES

The outer cell fuel flows to the inner cell by gravity through the intercell transfer valves, which open when the inner cell fuel quantity decreases to a given low level value. Each valve is operated by an electrical motor. The intercell transfer valve motor is attached at the rear or front wing spar while the valve body is inside the tank at Rib 15. The connection between the motor and the valve body is achieved through a rotating shaft. When controlled to open the valves are latched open and close again on ground during next refueling operation or electrical power up of the fuel system.

UGB13131 - U7ST0M0 - UM28D2000000001

1 MAIN FUEL PUMP & MAIN FUEL PUMP CANISTER
2 CROSSFEED VALVE
3 STRAINER
4 CHECK VALVE
5 SEQUENCE VALVE
6 SCAVENGE JET PUMP
7 PUMP PRESSURE SWITCH
8 CLACK VALVES
9 BYPASS SUCTION VALVE
10 AIR RELEASE VALVE
11 LP FUEL VALVE
12 INTERCELL TRANSFER VALVE
13 DEFUEL TRANSFER VALVE




INTERCELL TRANSFER VALVES

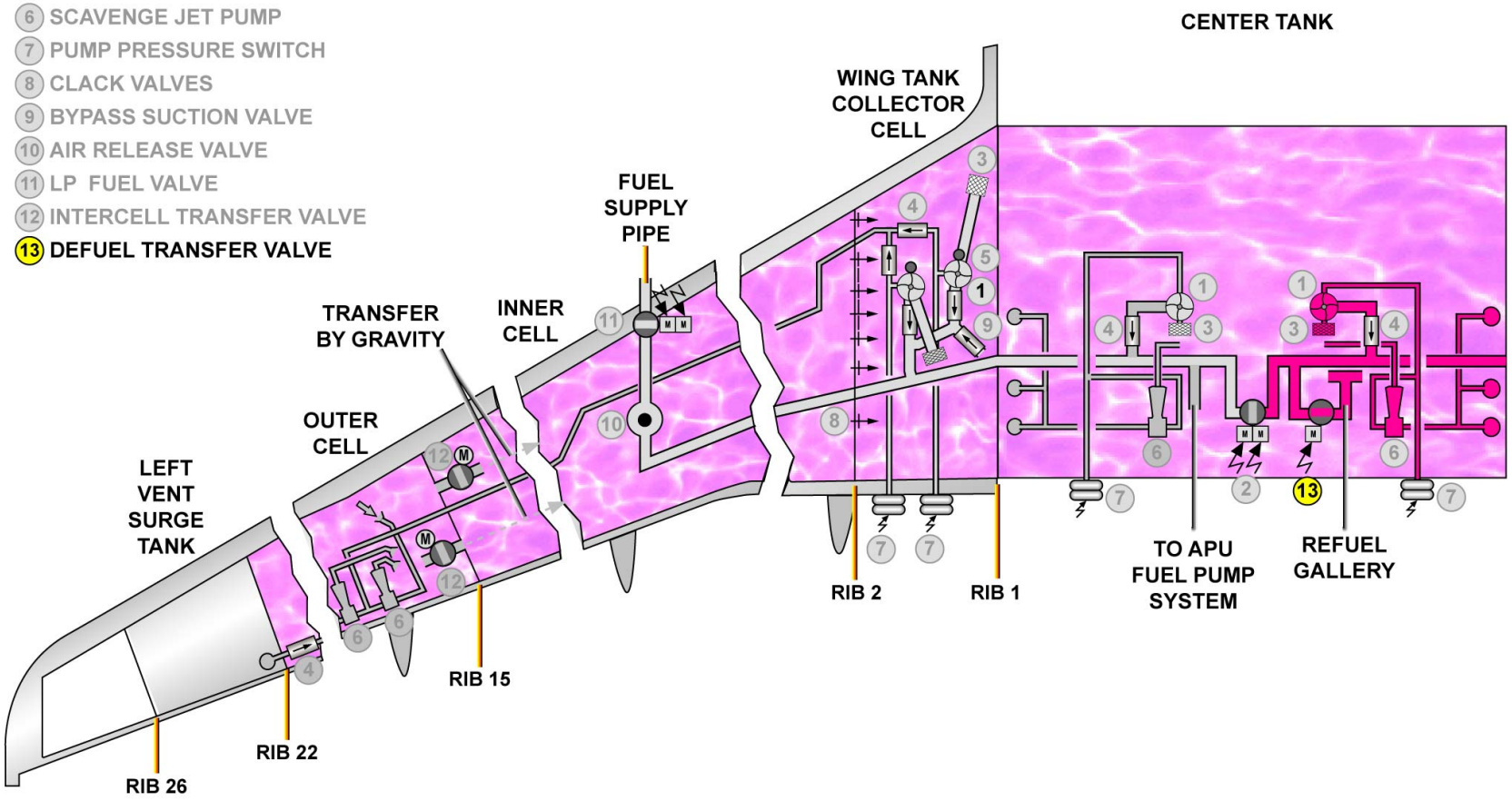
UGB13131 - U7ST0M0 - UM28D2000000001

# ENGINE FEED SYSTEM D/O (3)

## DFUEL TRANSFER VALVE

The defuel transfer valve is electrically controlled and operated by one DC motor. The control is done through the Refuel / Defuel control panel in the belly fairing. The valve can only be controlled to open on ground. When open, the valve interconnects the right hand engine supply line with the Refuel Gallery and allows fuel transfers and defueling operations. The crossfeed valve needs to be controlled to open from the cockpit overhead panel, if a connection to the left hand engine supply line is necessary.

1 MAIN FUEL PUMP & MAIN FUEL PUMP CANISTER
2 CROSSFEED VALVE
3 STRAINER
4 CHECK VALVE
5 SEQUENCE VALVE
6 SCAVENGE JET PUMP
7 PUMP PRESSURE SWITCH
8 CLACK VALVES
9 BYPASS SUCTION VALVE
10 AIR RELEASE VALVE
11 LP FUEL VALVE
12 INTERCELL TRANSFER VALVE
13 DEFUEL TRANSFER VALVE




DFUEL TRANSFER VALVE

UGB13131 - U7ST0M0 - UM28D2000000001

# FUEL IDG COOLING SYSTEM PRESENTATION (3)

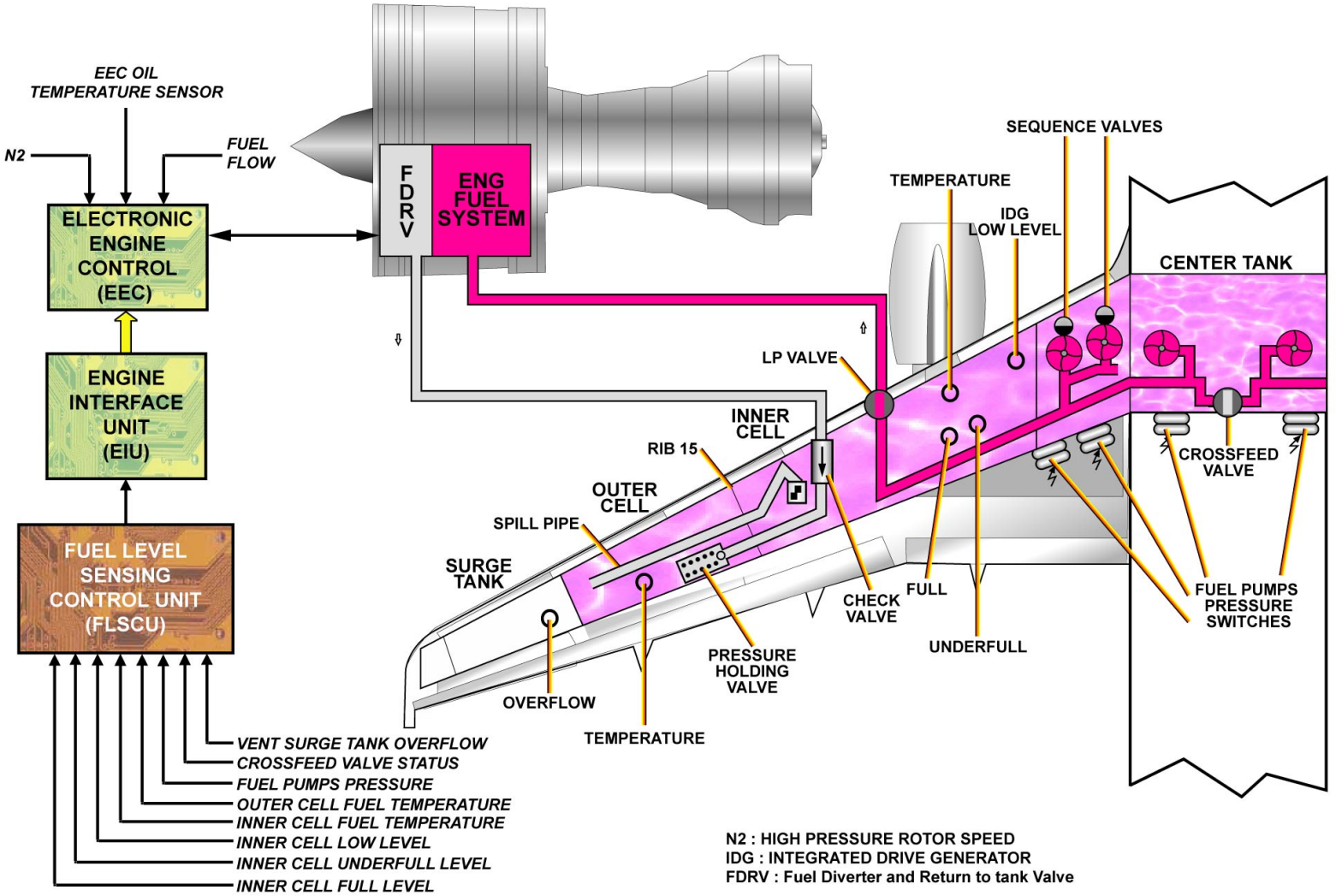
## B2 SCOPE

CAUTION: MODULE TAGGED B2 SCOPE.
BE AWARE THAT ONLY AVIONICS/ELECTRICAL TOPICS SHOULD BE LEARNED FOR A T2 COURSE.

## PRINCIPLE

The temperature of the Integrated Drive Generator (IDG) oil is decreased by fuel through a recirculation system. Some of the fuel that supplies the engines is used to decrease the temperature of the IDG oil. A Fuel Diverter and Return Valve (FDRV) lets the hot fuel return to the outer cell. The FDRV opens the fuel flow back to the aircraft tank in special engine configurations. The return valve mixes the hot fuel with cold fuel from the Low Pressure (LP) fuel pump to keep the temperature of the returned fuel less than 100°C (212°F). The Fuel Level Sensing Control Unit (FLSCU) 1 and the Engine Electronic Control (EEC) 1 control the recirculation system in the left wing. FLSCU 2 and EEC 2 control the right wing system.

UGB13131 - U7ST0M0 - UM28P1000000002




B2 SCOPE & PRINCIPLE

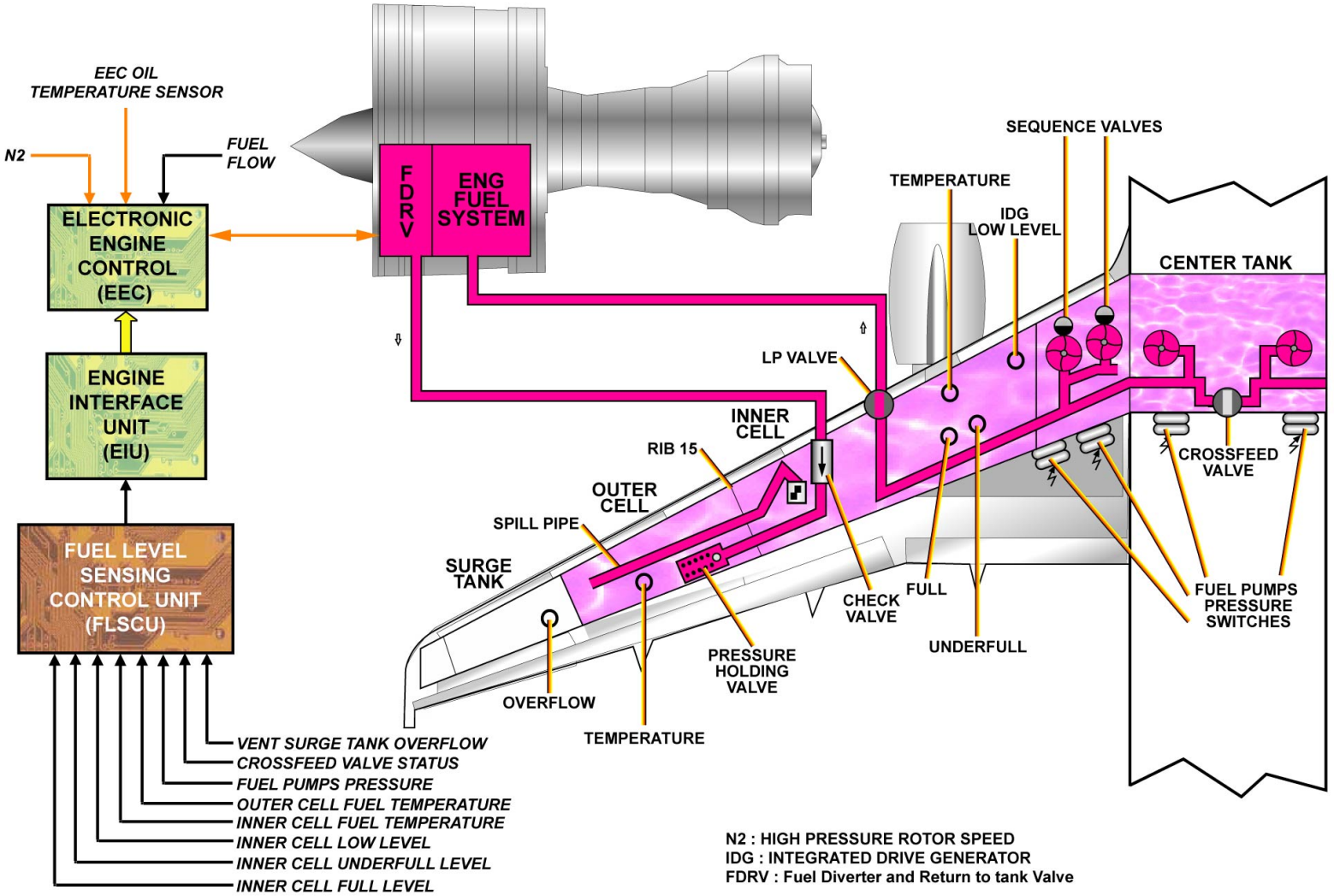
# FUEL IDG COOLING SYSTEM PRESENTATION (3)

## FUEL RETURN

The recirculated fuel is sent to the outer cell through a check valve and a pressure-holding valve to not let the fuel get to boiling temperature. The pressure-holding valve keeps a pressure of 15.5 psi in the return line. If the pressure increases, fuel bleeds through the valve into the outer cell. The check valve prevents fuel flow from the wing tank to the engine when the recirculation system is not in operation.

NOTE: Note: When the outer cell is full, the fuel overflows into the inner cell through a spill pipe.

UGB13131 - U7ST0M0 - UM28P1000000002


EEC OIL TEMPERATURE SENSOR
N2
FUEL FLOW
ELECTRONIC ENGINE CONTROL (EEC)
ENGINE INTERFACE UNIT (EIU)
FUEL LEVEL SENSING CONTROL UNIT (FLSCU)
FDRV
ENG FUEL SYSTEM
SEQUENCE VALVES
TEMPERATURE
IDG LOW LEVEL
CENTER TANK
LP VALVE
INNER CELL
RIB 15
OUTER CELL
SPILL PIPE
SURGE TANK
CHECK VALVE
FULL
UNDERFULL
CROSSFEED VALVE
FUEL PUMPS PRESSURE SWITCHES
PRESSURE HOLDING VALVE
OVERFLOW
TEMPERATURE
VENT SURGE TANK OVERFLOW
CROSSFEED VALVE STATUS
FUEL PUMPS PRESSURE
OUTER CELL FUEL TEMPERATURE
INNER CELL FUEL TEMPERATURE
INNER CELL LOW LEVEL
INNER CELL UNDERFULL LEVEL
INNER CELL FULL LEVEL
N2 : HIGH PRESSURE ROTOR SPEED
IDG : INTEGRATED DRIVE GENERATOR
FDRV : Fuel Diverter and Return to tank Valve

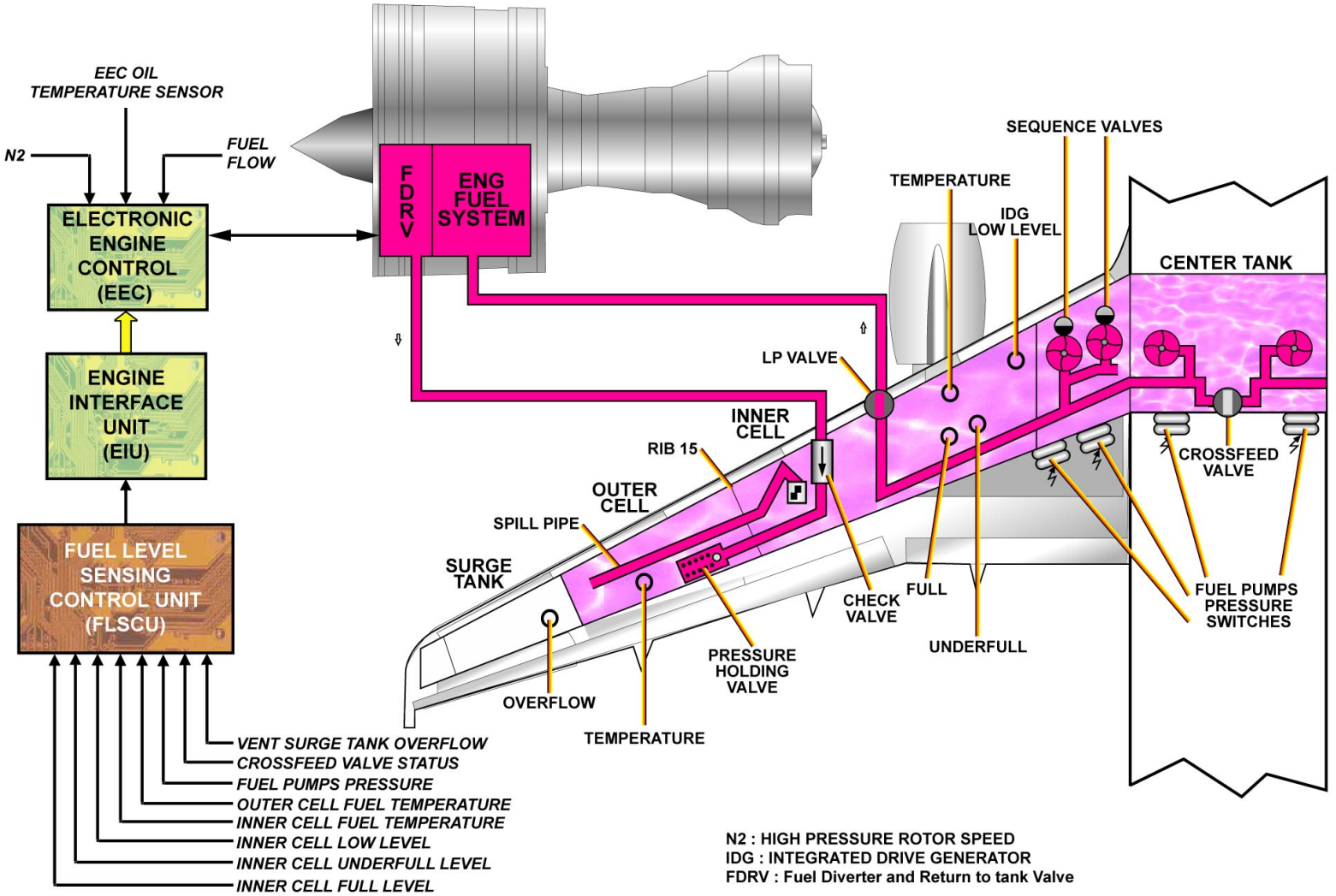
FUEL RETURN

# FUEL IDG COOLING SYSTEM PRESENTATION (3)

## PUMP LOGIC

While fuel is supplied from the center tank, the wing tanks will stay full and will possibly overfill because the returned fuel is supplied to the wing tanks. If this occurs, the center tank pump stops when the inner cell gets to the FULL level sensor. The wing tank pumps will supply the fuel to the engine until approximately 500 kg (1100 lbs) of fuel are used and the UNDERFULL sensor is reached. The logic circuit then starts the center tank pump again.

UGB13131 - U7ST0M0 - UM28P1000000002


EEC OIL TEMPERATURE SENSOR
N2
FUEL FLOW
ELECTRONIC ENGINE CONTROL (EEC)
ENGINE INTERFACE UNIT (EIU)
FUEL LEVEL SENSING CONTROL UNIT (FLSCU)
F D R V
ENG FUEL SYSTEM
SEQUENCE VALVES
TEMPERATURE
IDG LOW LEVEL
CENTER TANK
LP VALVE
INNER CELL
RIB 15
OUTER CELL
SPILL PIPE
SURGE TANK
CHECK VALVE
FULL
UNDERFULL
CROSSFEED VALVE
FUEL PUMPS PRESSURE SWITCHES
PRESSURE HOLDING VALVE
OVERFLOW
TEMPERATURE
VENT SURGE TANK OVERFLOW
CROSSFEED VALVE STATUS
FUEL PUMPS PRESSURE
OUTER CELL FUEL TEMPERATURE
INNER CELL FUEL TEMPERATURE
INNER CELL LOW LEVEL
INNER CELL UNDERFULL LEVEL
INNER CELL FULL LEVEL
N2 : HIGH PRESSURE ROTOR SPEED
IDG : INTEGRATED DRIVE GENERATOR
FDRV : Fuel Diverter and Return to tank Valve

PUMP LOGIC

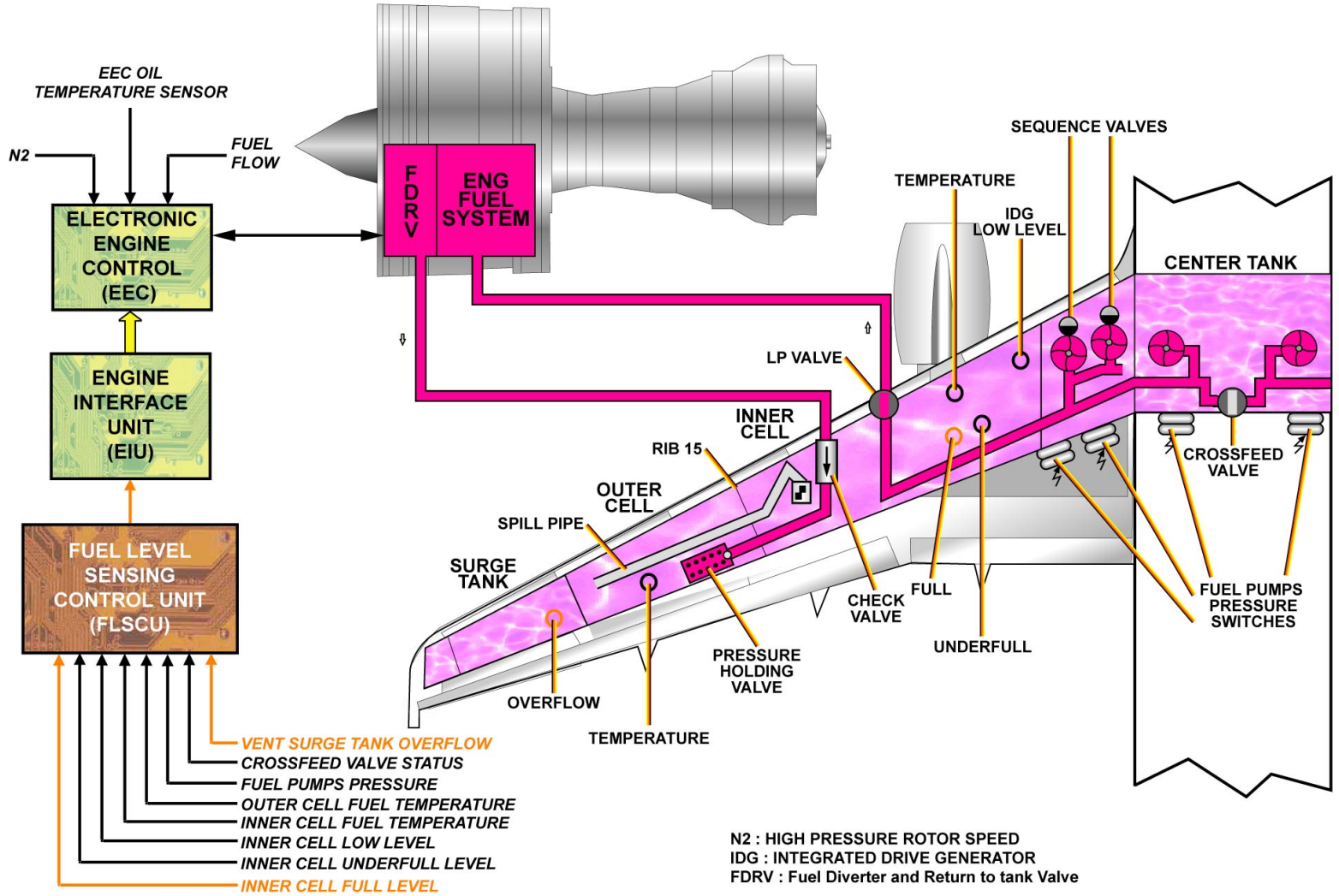
# FUEL IDG COOLING SYSTEM PRESENTATION (3)

## FUEL DIVERTER AND RETURN VALVE CLOSURE

### OVERFLOW

The Fuel Diverter and Return Valve (FDRV) closes if the center tank pump does not obey the logic signals of the full level sensors. This causes the wing tank to overflow through the tank ventilation system into the vent surge tank.
The overflow sensor sends an electrical signal to the FLSCU. The FLSCU sends a closure signal to the Engine Electronic Control (EEC) through the Engine Interface Unit (EIU). The EEC closes the FDRV and stops the fuel supply back to the outer cell.

UGB13131 - U7ST0M0 - UM28P1000000002




FUEL DIVERTER AND RETURN VALVE CLOSURE - OVERFLOW

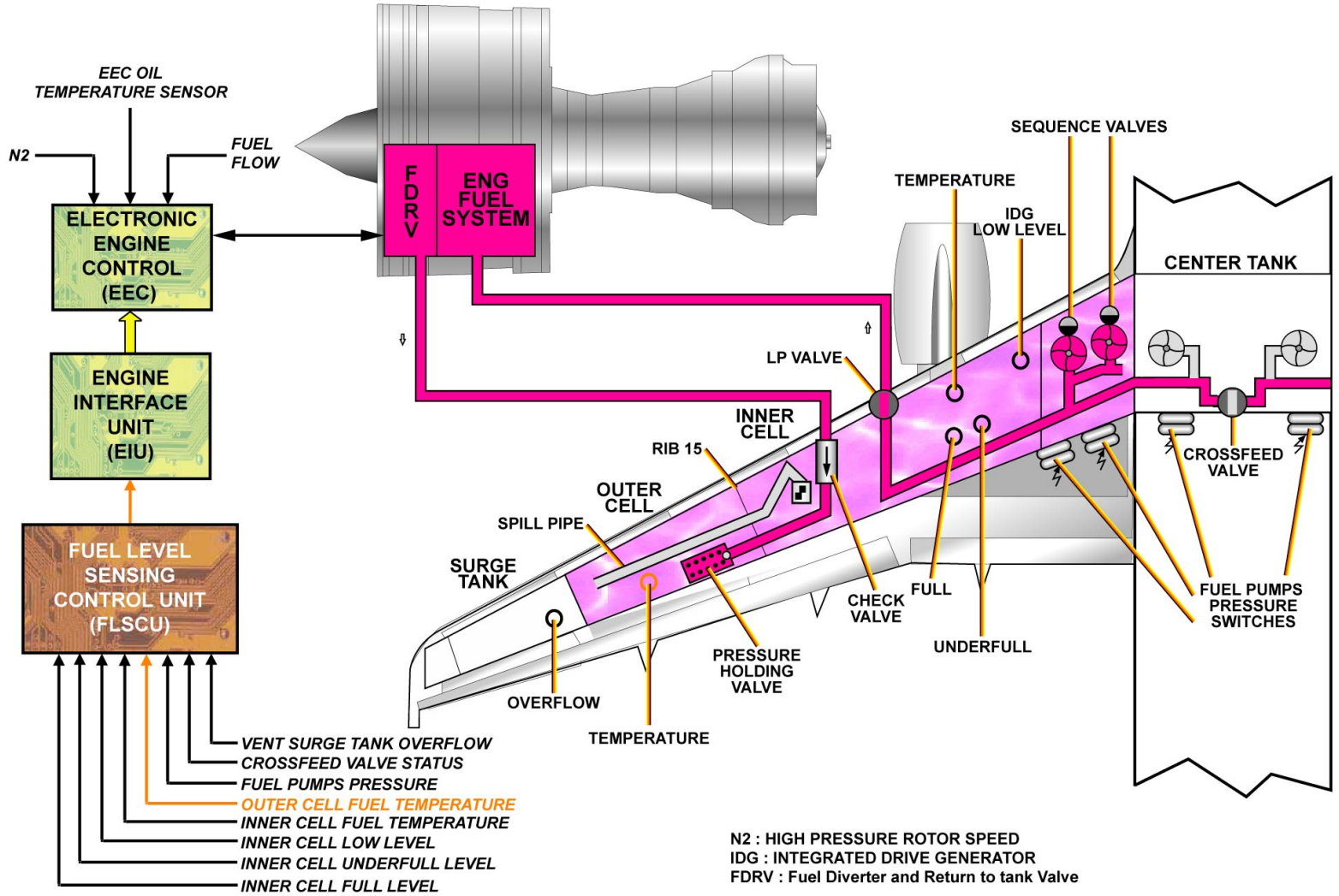
# FUEL IDG COOLING SYSTEM PRESENTATION (3)

## FUEL DIVERTER AND RETURN VALVE CLOSURE (continued)

### OUTER CELL HIGH TEMPERATURE

The FDRV closes if the fuel temperature is too high in the outer cell, i.e. 52.5°C (126.5°F). Because the returned fuel from the engine is hot, the FLSCU prevents an overtemperature in the wing tanks. The FLSCU sends a closure signal to the Engine Electronic Control (EEC) through the Engine Interface Unit (EIU). The EEC closes the FDRV and stops the fuel supply back to the outer cell.

UGB13131 - U7ST0M0 - UM28P1000000002




FUEL DIVERTER AND RETURN VALVE CLOSURE - OUTER CELL HIGH TEMPERATURE

UGB13131 - U7ST0M0 - UM28P1000000002

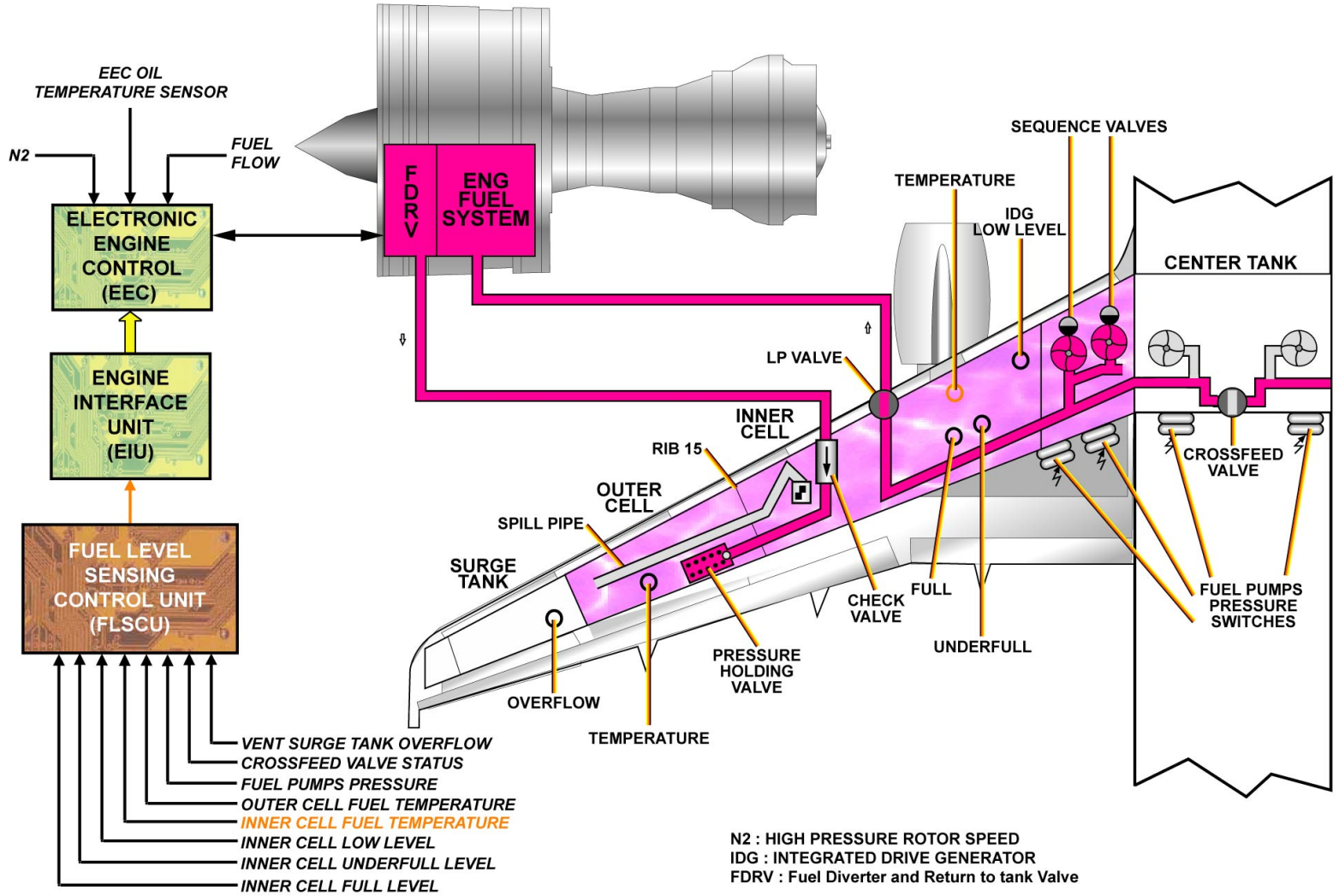
# FUEL IDG COOLING SYSTEM PRESENTATION (3)

## FUEL DIVERTER AND RETURN VALVE CLOSURE (continued)

### INNER CELL HIGH TEMPERATURE

The FDRV closes if the fuel temperature in the inner cell is too high, i.e. 55°C (131°F). Thus a large volume of high-temperature fuel will not go into the inner cell if the intercell valve opens. This also keeps the fuel temperature at an acceptable level if a tank rupture occurs.

UGB13131 - U7ST0M0 - UM28P1000000002




FUEL DIVERTER AND RETURN VALVE CLOSURE - INNER CELL HIGH TEMPERATURE

UGB13131 - U7ST0M0 - UM28P1000000002

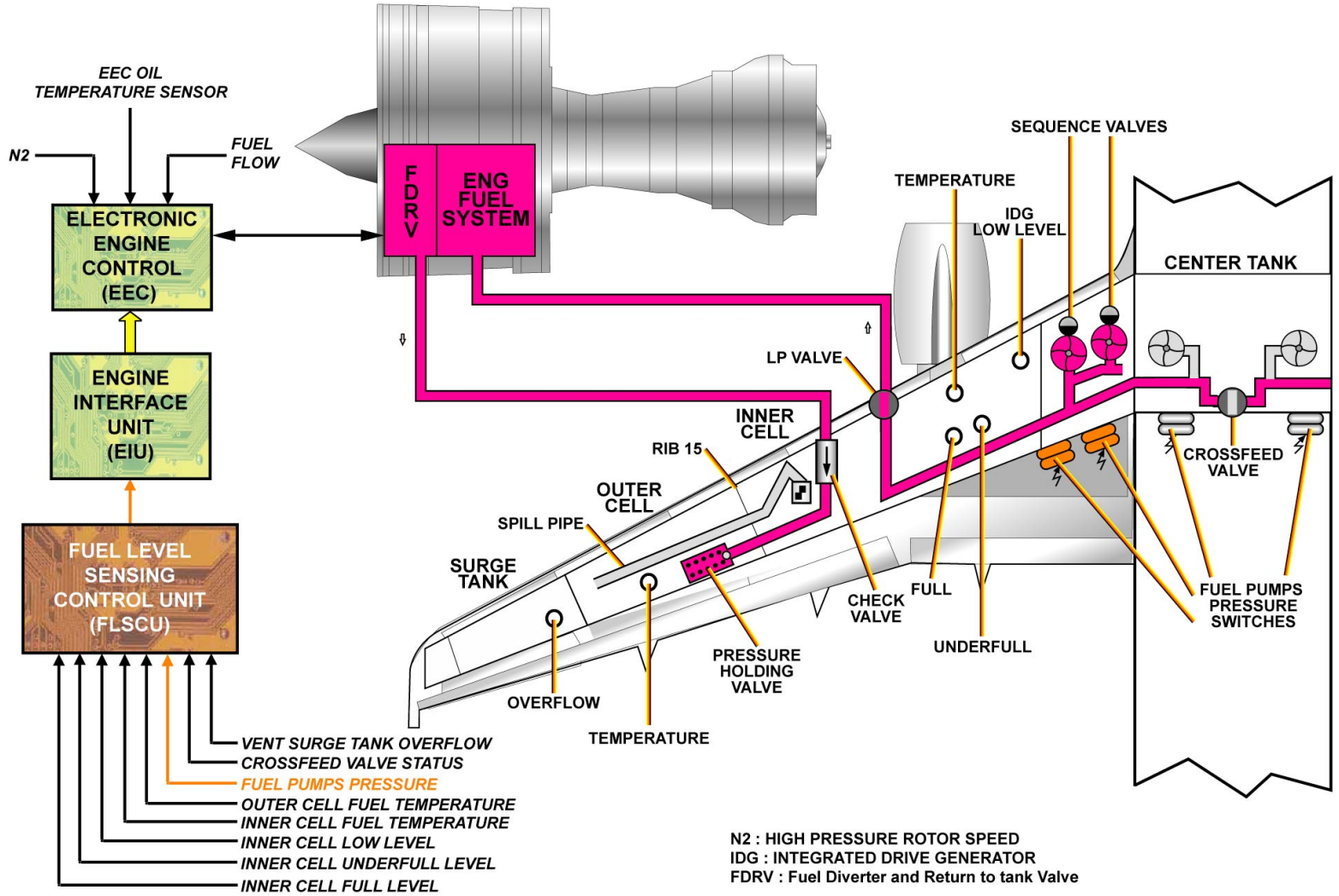
# FUEL IDG COOLING SYSTEM PRESENTATION (3)

## FUEL DIVERTER AND RETURN VALVE CLOSURE (continued)

### PUMP PRESSURE LOSS

The FDRV closes if a fuel pump Low Pressure (LP) is sensed by all pump pressure switches of one wing for the related engine when the crossfeed valve is closed, or if a fuel pump LP is sensed by all pump pressure switches of the two wings when the crossfeed valve is open. This is to stop the return fuel flow during engine gravity feeding. LP is sensed by the pump LP switch and a signal is sent to the FLSCU.

UGB13131 - U7ST0M0 - UM28P1000000002




FUEL DIVERTER AND RETURN VALVE CLOSURE - PUMP PRESSURE LOSS

# FUEL IDG COOLING SYSTEM PRESENTATION (3)

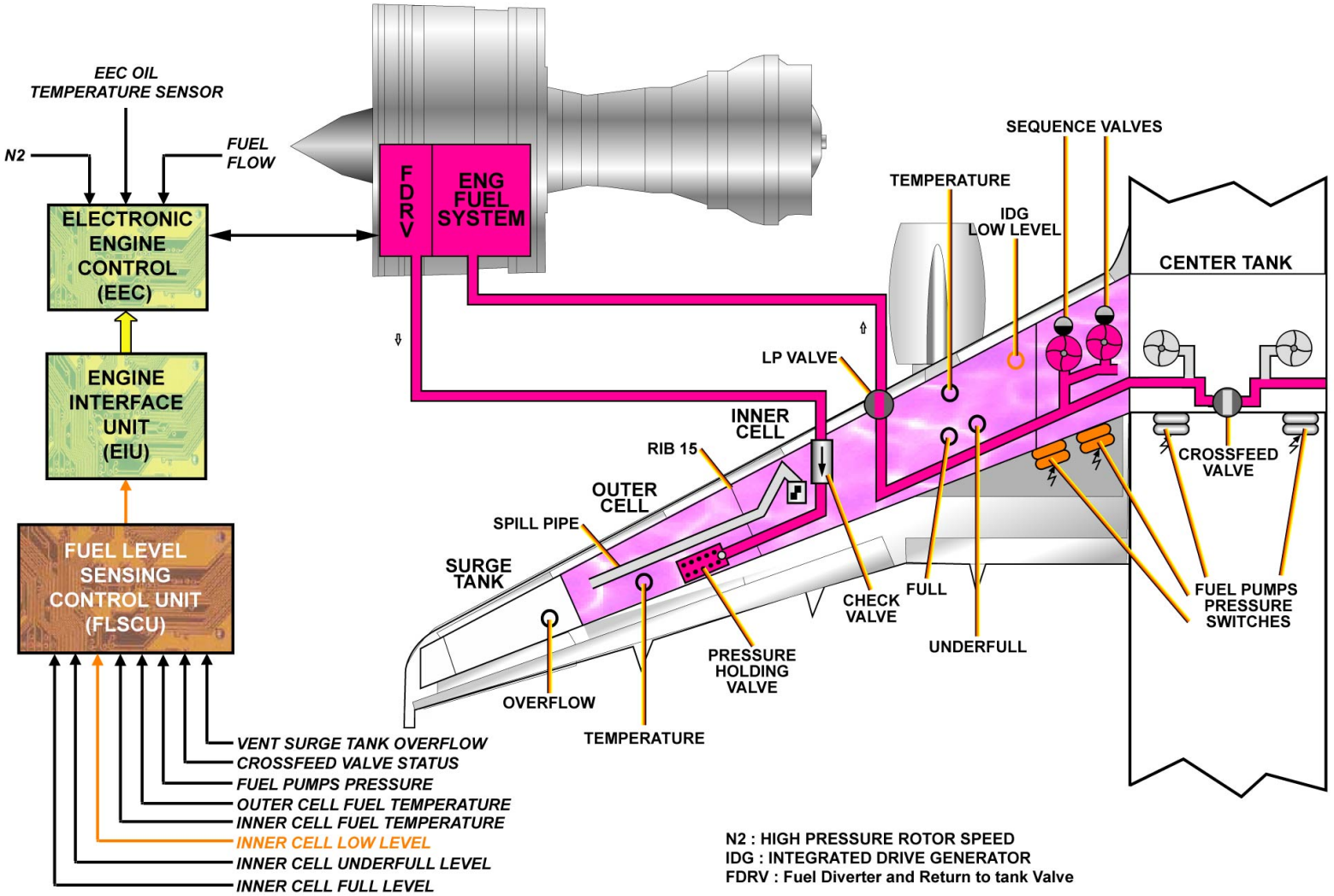
## FUEL DIVERTER AND RETURN VALVE CLOSURE (continued)

### LOW LEVEL

The FDRV closes when the fuel level in the inner cell decreases to the IDG LOW LEVEL sensor at 280 kg (620 lbs).

NOTE: Note: When the fuel return valve closes, this decreases the quantity of fuel that cannot be used.

UGB13131 - U7ST0M0 - UM28P1000000002



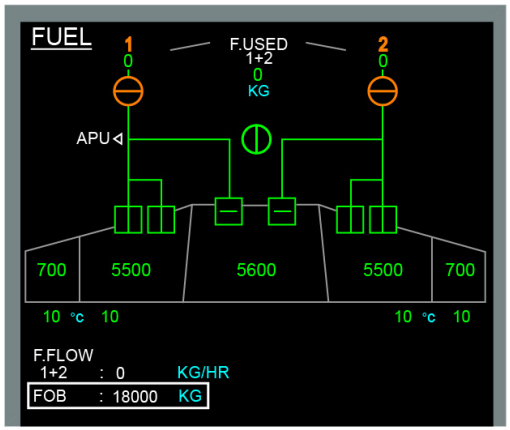

FUEL DIVERTER AND RETURN VALVE CLOSURE - LOW LEVEL

# FUEL SYSTEM NORMAL OPERATION (2)

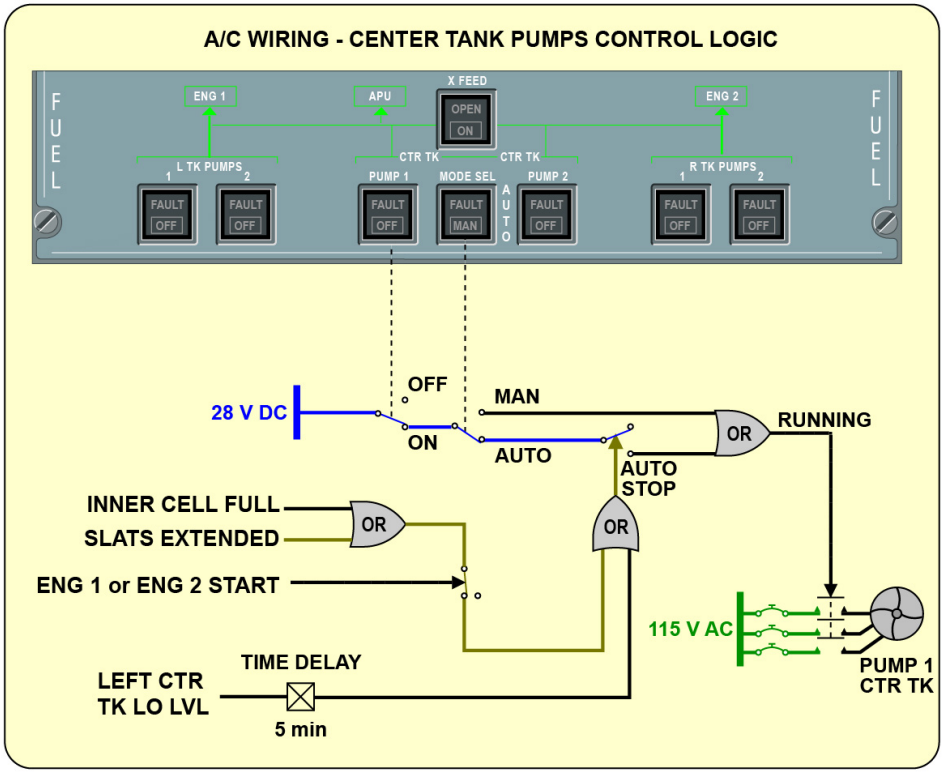
## AUTO MODE

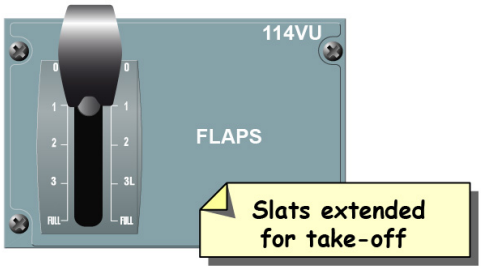
The A/C is on the ground, slats extended and center tank pumps in AUTO MODE. When all tank pump P/Bs are pressed, wing tank pumps are running all the time and center tank pumps are not running because the slats are extended.

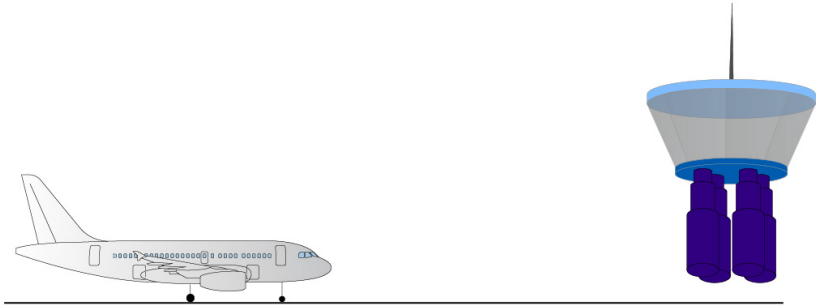
UGB13131 - U7ST0M0 - UM28P3000000001




ECAM



AUTO MODE

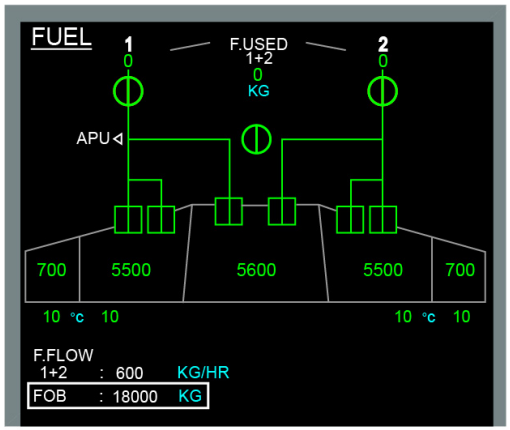
# FUEL SYSTEM NORMAL OPERATION (2)

## AUTO MODE (continued)

### AT ENGINE START AN DURING THE FOLLOWING 2 MINUTES

At engine start, the fuel used indication is reset. The engine identification number becomes white.
During the engine start sequence and in the following 2 minutes, the center tank pumps run regardless of the slat position. When running, center tank pumps have priority for engine supply over wing tank pumps. After this delay, center tank pumps stop because slats are still extended.

UGB13131 - U7ST0M0 - UM28P3000000001

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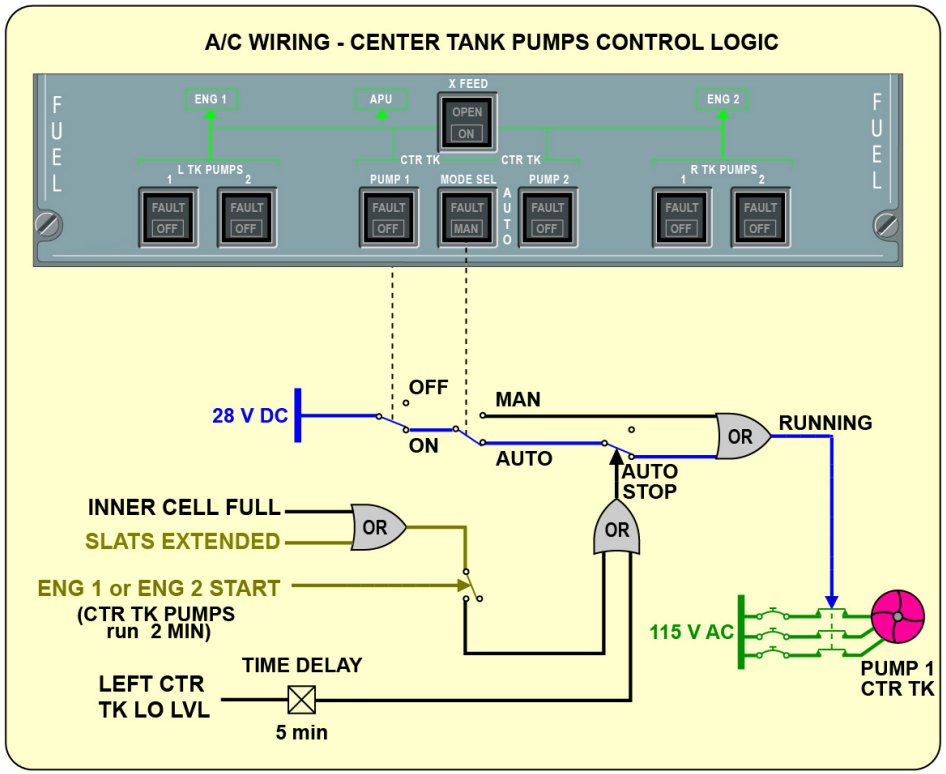
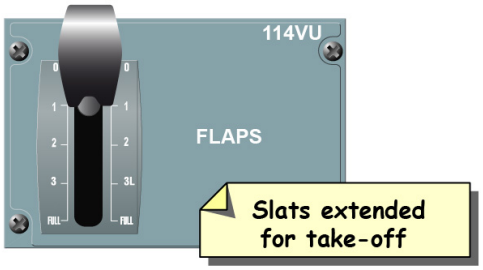
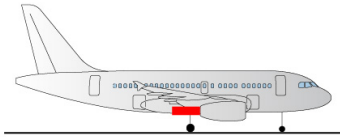
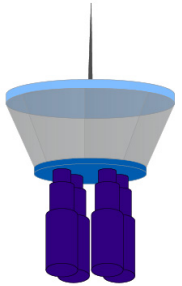



The center tank pumps stop 2 min after engine start.





AUTO MODE - AT ENGINE START AN DURING THE FOLLOWING 2 MINUTES

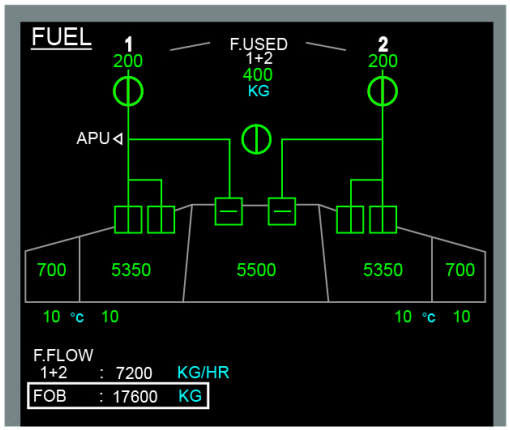
# FUEL SYSTEM NORMAL OPERATION (2)

## AUTO MODE (continued)

### TAKE OFF

The two minutes time delay has expired. The CTR TK pumps are stopped.
The A/C is ready for takeoff.

UGB13131 - U7ST0M0 - UM28P3000000001

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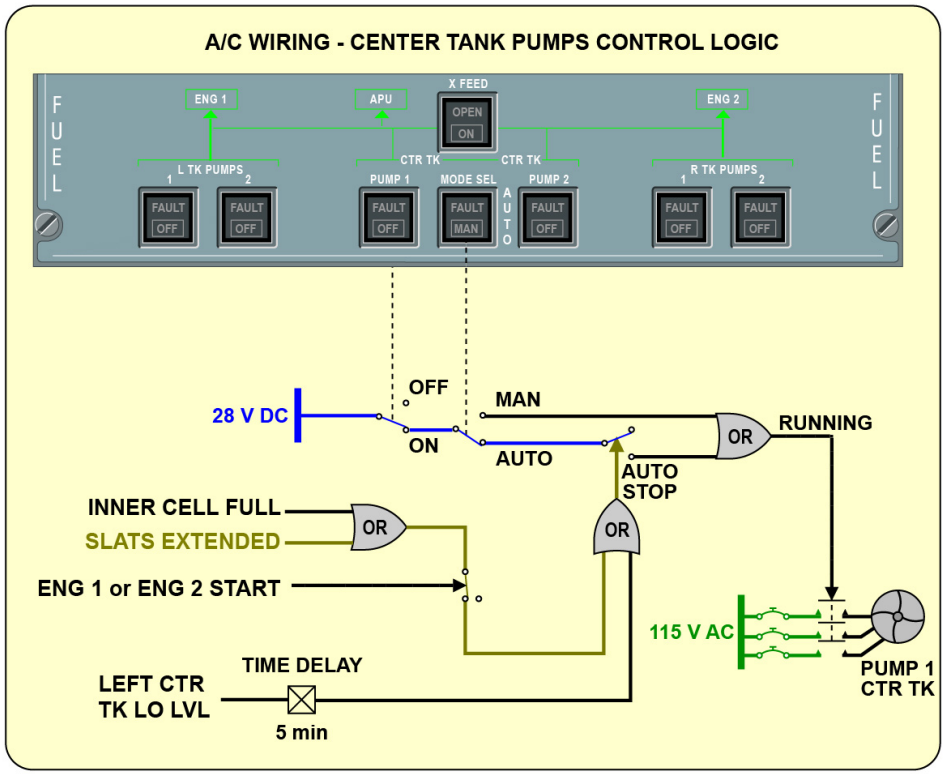
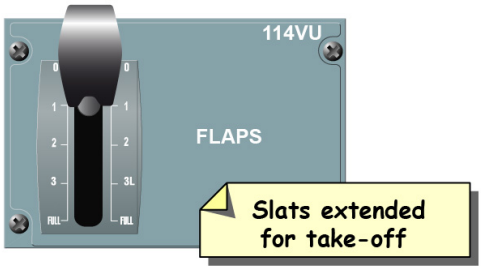


AUTO MODE - TAKE OFF

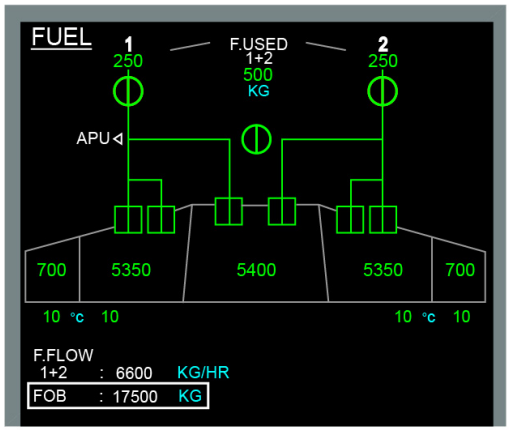
# FUEL SYSTEM NORMAL OPERATION (2)

## AUTO MODE (continued)

### SLATS RETRACTED

With the slats retracted, the center tank pumps start again.

UGB13131 - U7ST0M0 - UM28P3000000001

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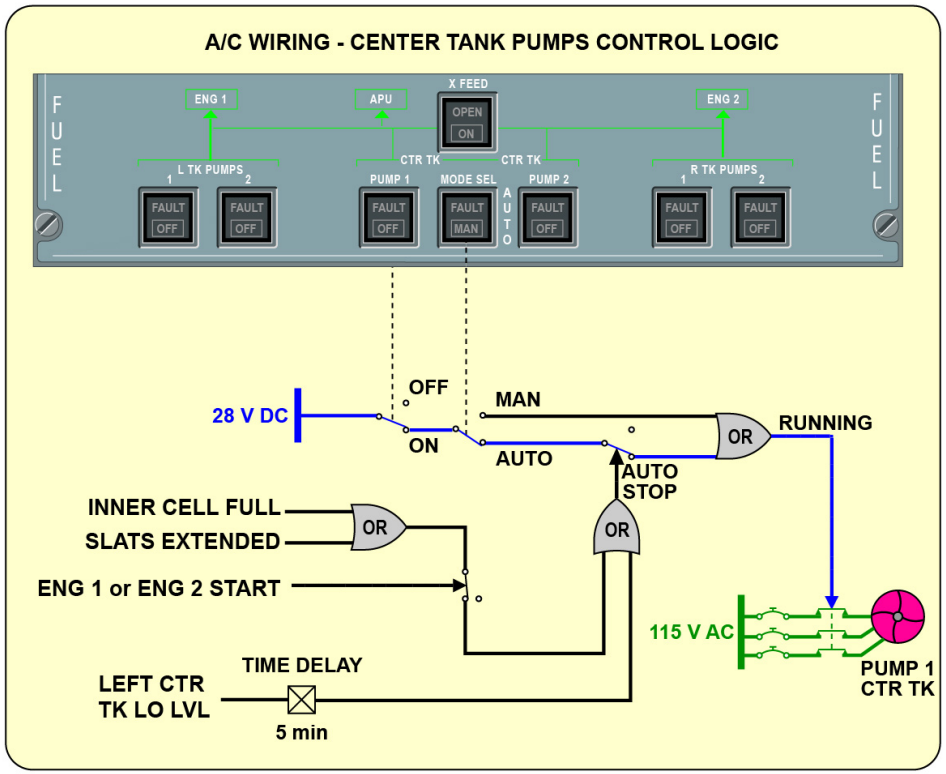
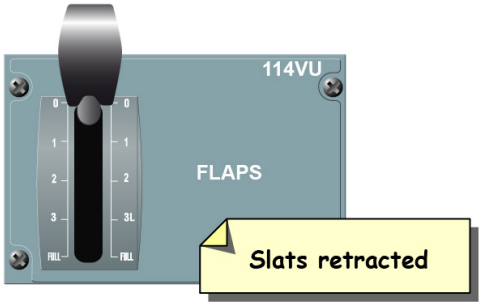


AUTO MODE - SLATS RETRACTED

# FUEL SYSTEM NORMAL OPERATION (2)

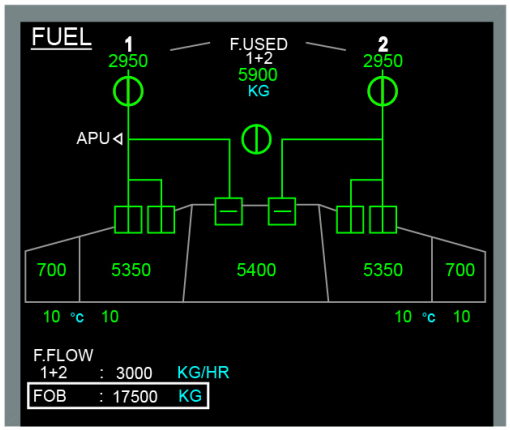
## AUTO MODE (continued)

### IN CRUISE

In the fuel system of the engine, fuel is also used for oil cooling. Some of the hot fuel is then recirculated into the wing tank. As long as the center tank pump supplies the engine the recirculated fuel continuously fills the wing tank. When the fuel in the wing tank inner cell has reached the FULL level, the center tank pump is controlled to stop, and is displayed green, cross line on the ECAM. Now the wing tank pumps supply the engine until the fuel level in the wing tank has decreased by 500 kg, and has therefore reached the UNDERFULL level. The center tank pump is controlled to run again, and is displayed green, in line on the ECAM. Each center tank pump is controlled independently by its adjacent wing tank level sensors, i.e. full and underfull.

UGB13131 - U7ST0M0 - UM28P3000000001

* CTR TK Pump stops when wing tank at FULL level due to fuel recirculation, restarts at UNDERFULL level (500 kg difference)

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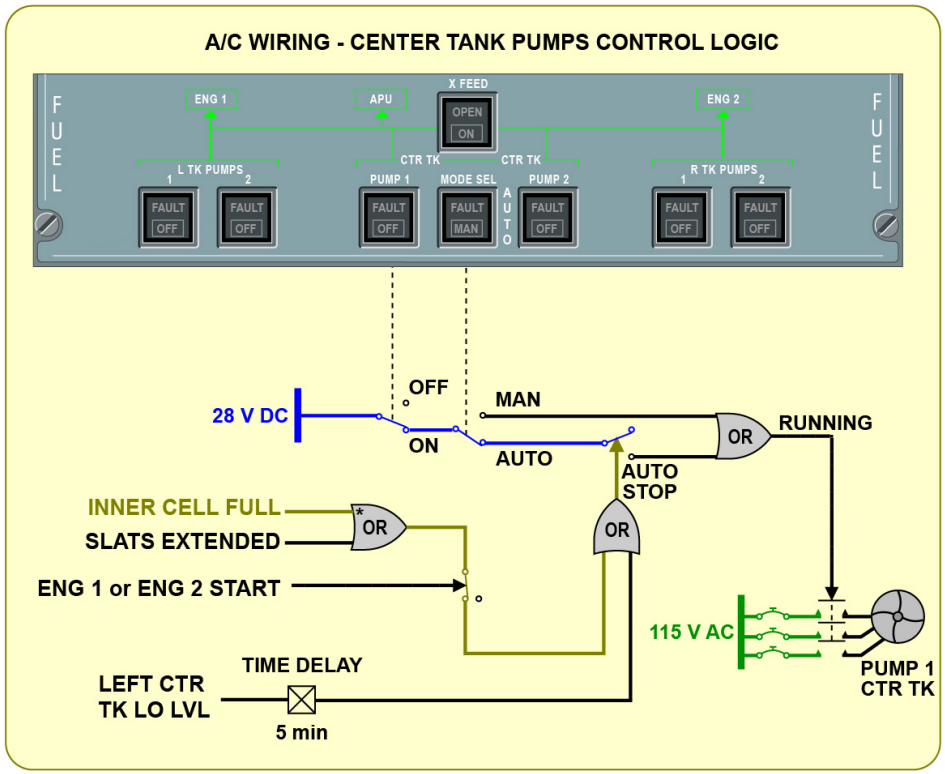
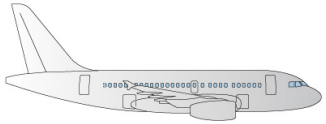


AUTO MODE - IN CRUISE

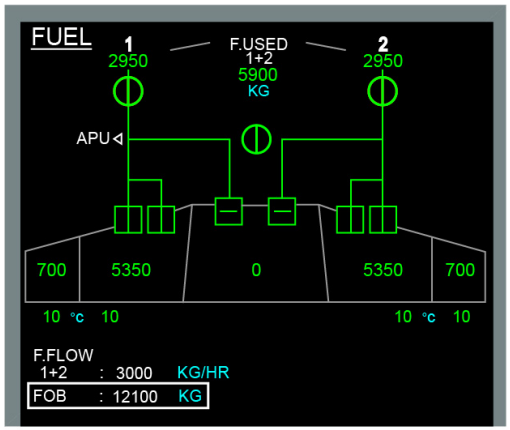
# FUEL SYSTEM NORMAL OPERATION (2)

## AUTO MODE (continued)

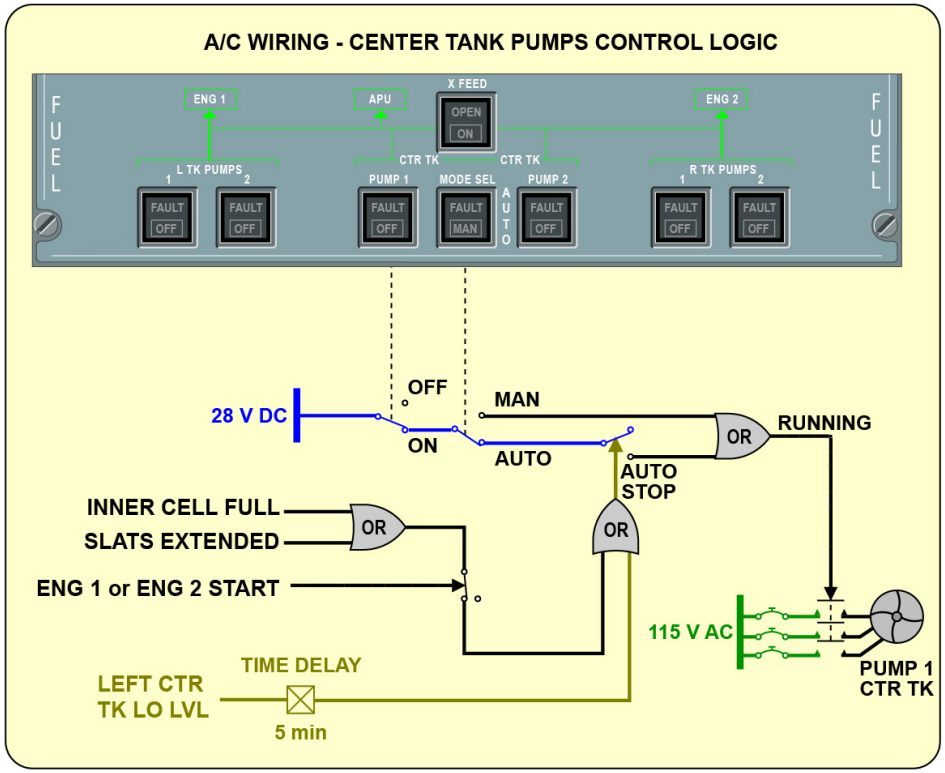
### CTR TANK LOW LEVEL AT CRUISE

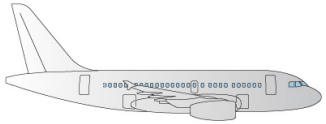
The A/C is in cruise. We can see the fuel quantity indication on the center tank. When the center tank fuel has been used, the center tank pumps stop automatically 5 minutes after the center tank fuel low level has been reached. The wing tank pumps continue to supply the engines.

UGB13131 - U7ST0M0 - UM28P3000000001




ECAM





AUTO MODE - CTR TANK LOW LEVEL AT CRUISE

# FUEL SYSTEM NORMAL OPERATION (2)

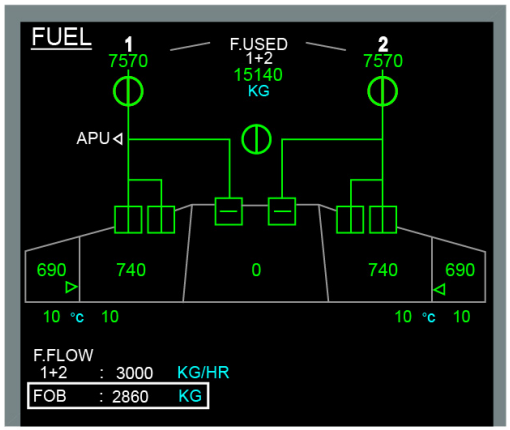
## AUTO MODE (continued)

### INNER CELL LOW LEVEL

We can see the fuel quantity indication on the wing tank. When the first inner cell quantity decreases to the LO LVL value, the transfer valves open automatically and are latched until the next refueling. The outer cell fuel flows to the related side inner cell.

UGB13131 - U7ST0M0 - UM28P3000000001

* Intercell Transfer Valves open, when there is a LO LVL in one wing tank.

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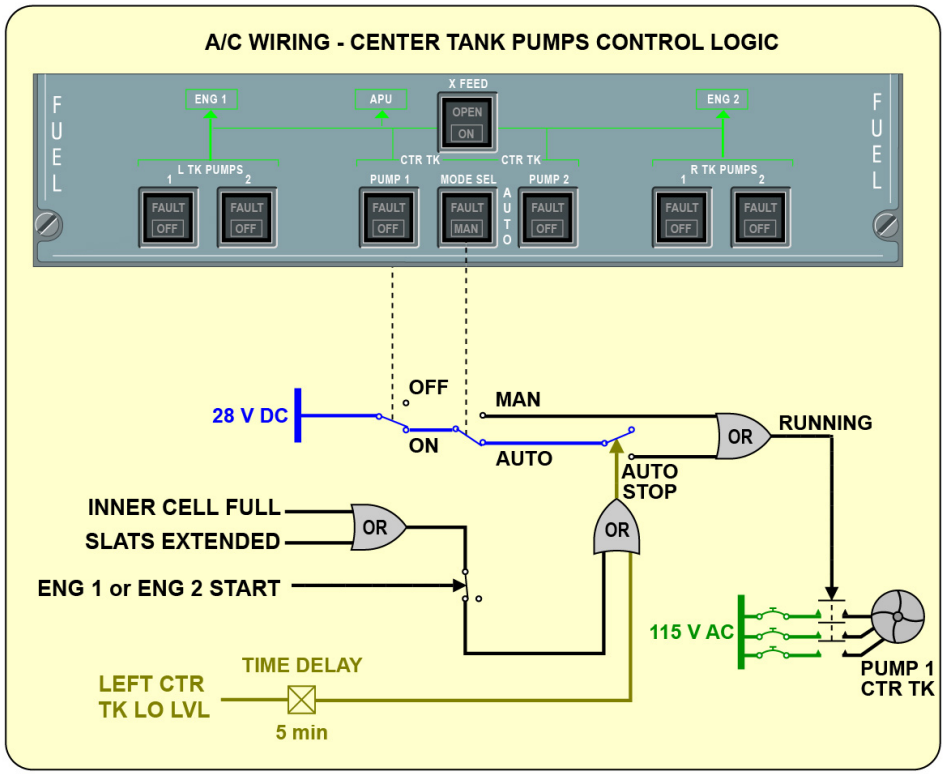
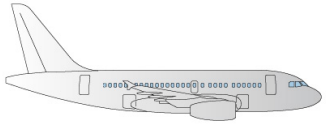


AUTO MODE - INNER CELL LOW LEVEL

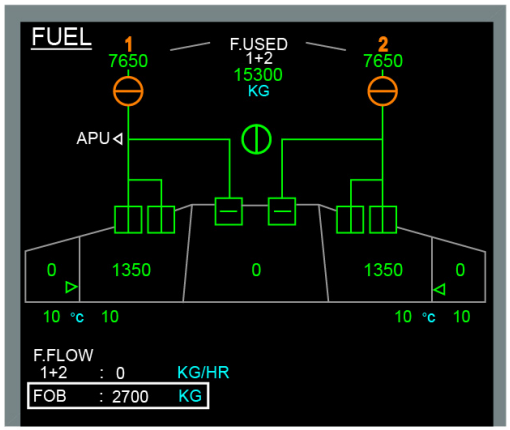
# FUEL SYSTEM NORMAL OPERATION (2)

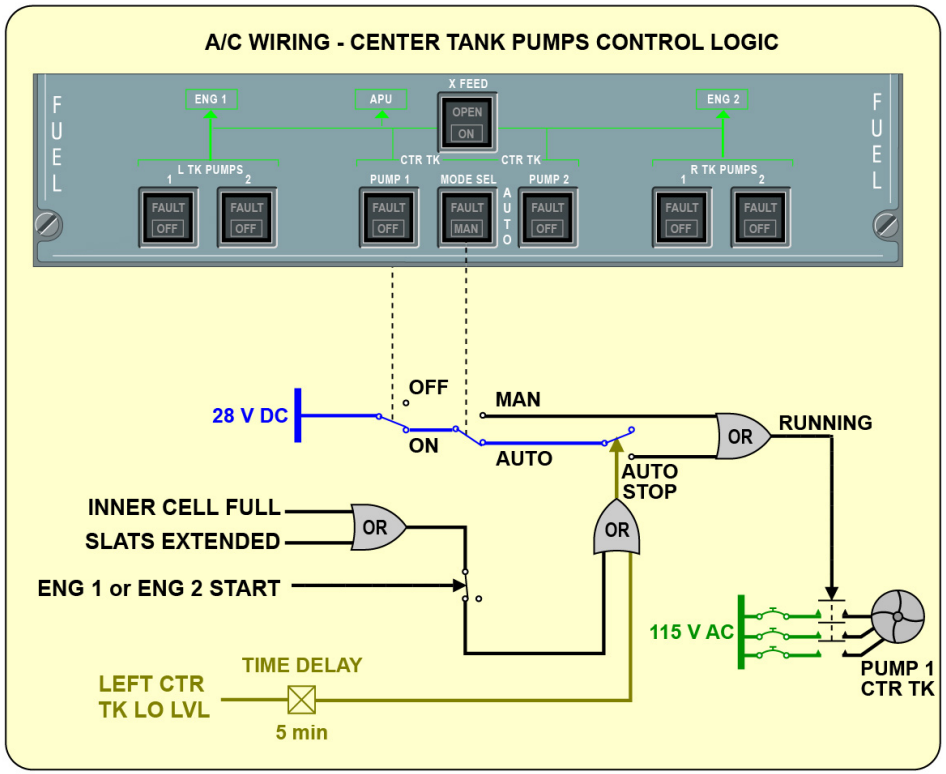
## AUTO MODE (continued)

### LANDING

After landing, when the engines are stopped, the engine identification numbers become amber.

UGB13131 - U7ST0M0 - UM28P3000000001



ENG 1 + 2 MASTER OFF

AUTO MODE - LANDING

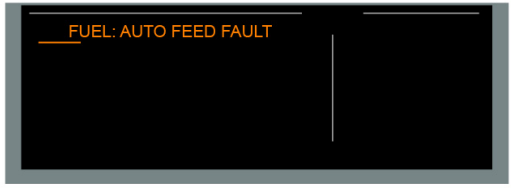
# FUEL SYSTEM NORMAL OPERATION (2)

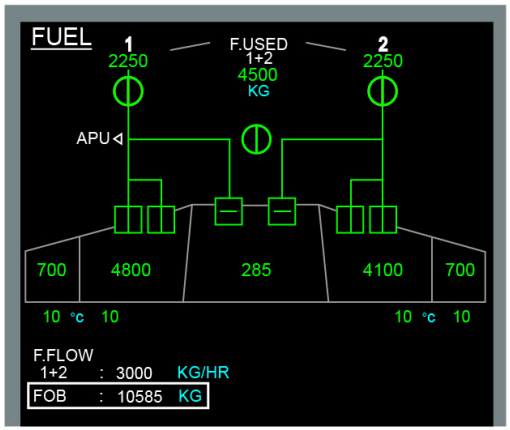
## AUTO FEED FAULT / MANUAL MODE

The A/C is in cruise.
As soon as the Fuel Quantity Indication System detects a Fuel Qty in one or both Wing Tanks with less than 5000 KG and more than 250 KG in the CTR Tank, the FAULT will be indicated by:
- Master Caution and Single Chime,
- EWD "FUEL AUTO FEED FAULT" message,
- FAULT light in Mode select P/B.

UGB13131 - U7ST0M0 - UM28P3000000001

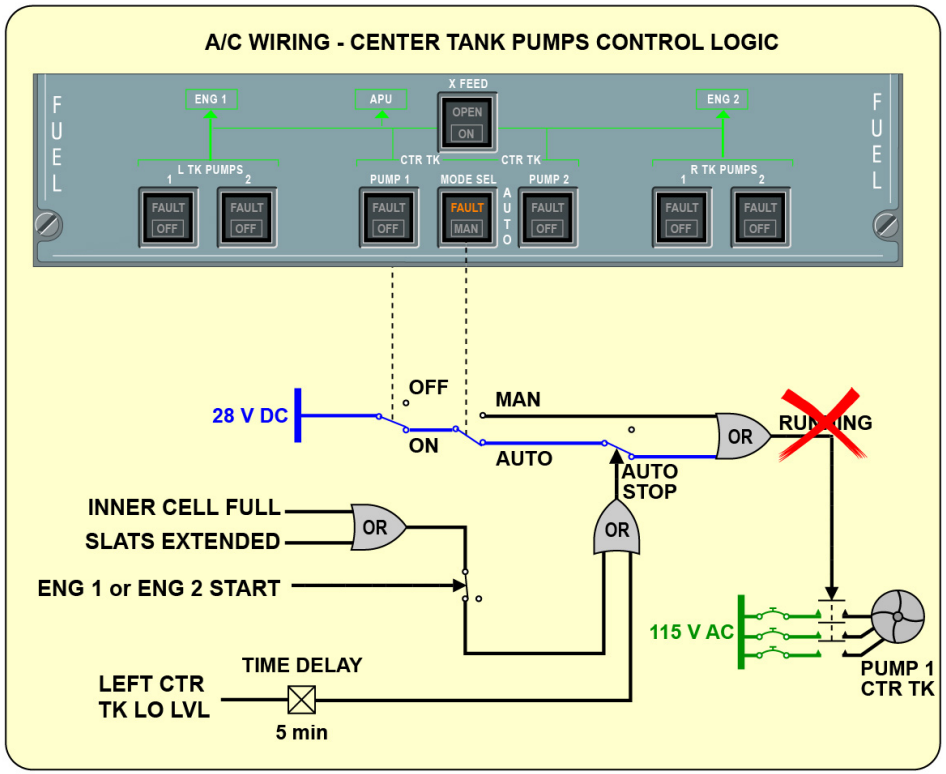
EWD

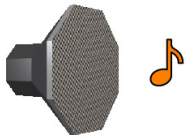


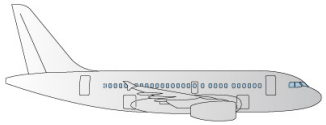




ECAM

(131VU)





AUTO FEED FAULT / MANUAL MODE

# FUEL SYSTEM NORMAL OPERATION (2)

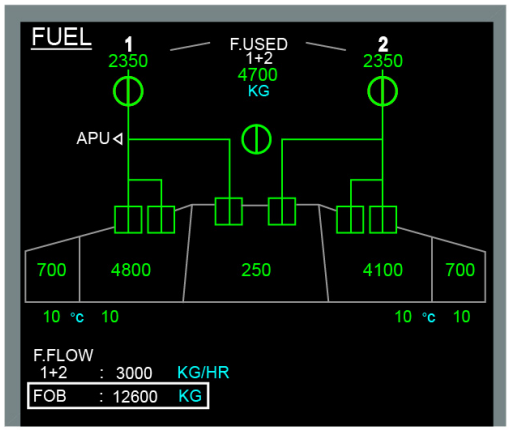
## AUTO FEED FAULT / MANUAL MODE (continued)

### MANUAL MODE SELECTED

When selected the MODE SEL P/B MAN light comes on white. The center tank pumps run again.

UGB13131 - U7ST0M0 - UM28P3000000001

EWD

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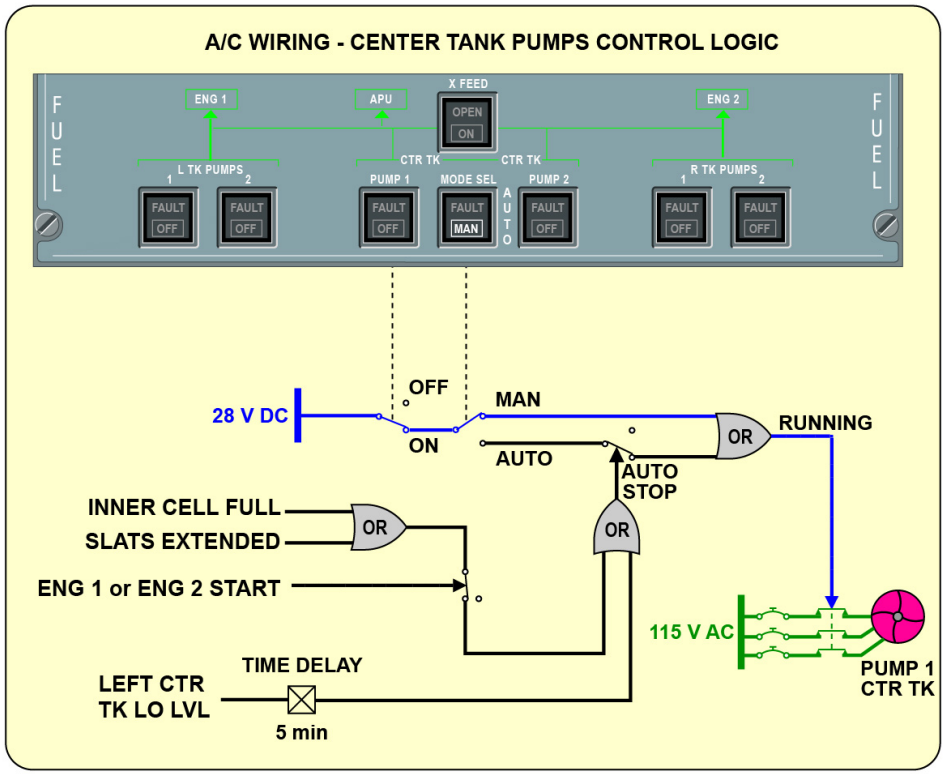
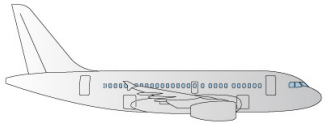
(131VU)



AUTO FEED FAULT / MANUAL MODE - MANUAL MODE SELECTED

# FUEL SYSTEM NORMAL OPERATION (2)

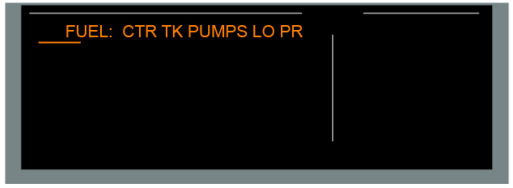
## AUTO FEED FAULT / MANUAL MODE (continued)

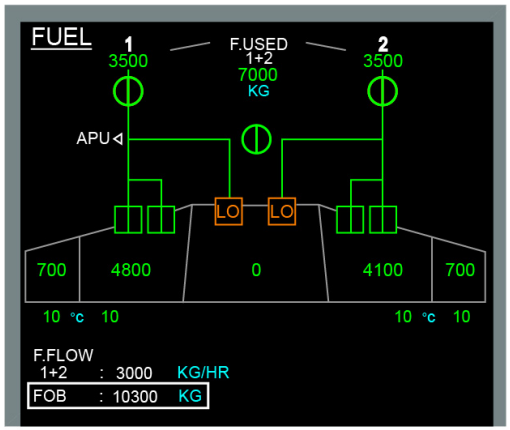
### CENTER TANK EMPTY

We can see the fuel quantity indication on the center tank, the MASTER CAUT comes on and the aural warning sounds. When the center tank is empty, the pump LO press warnings come on as the pumps continue to run.

UGB13131 - U7ST0M0 - UM28P3000000001

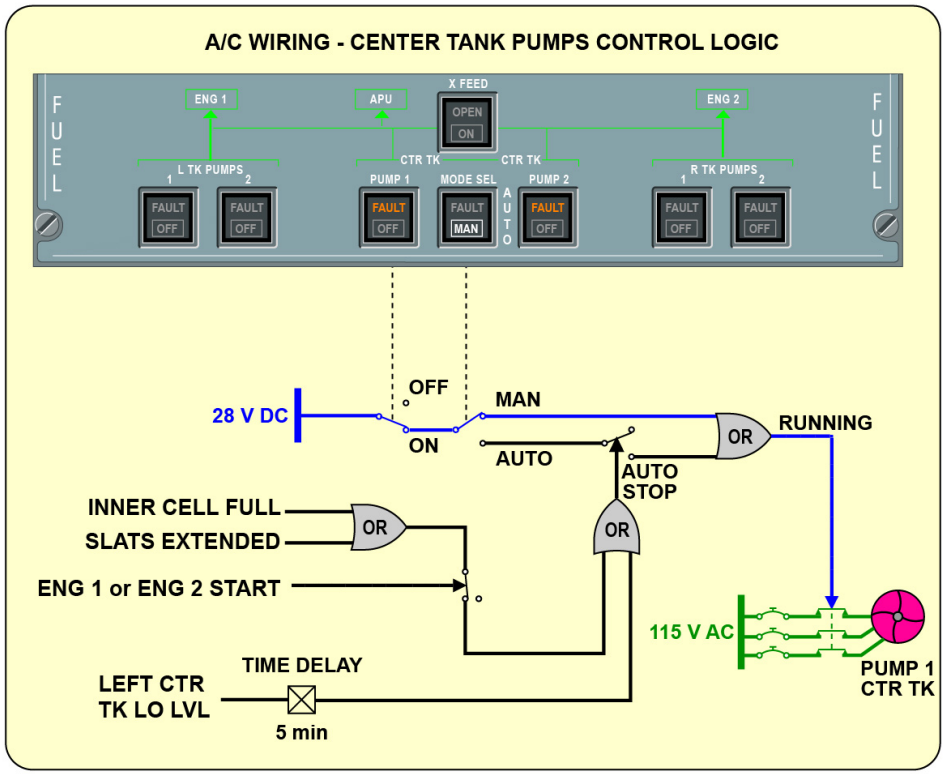
EWD

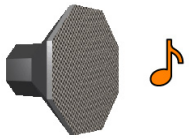


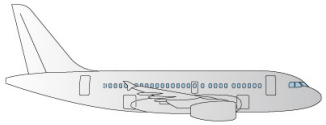




ECAM

(131VU)





AUTO FEED FAULT / MANUAL MODE - CENTER TANK EMPTY

# FUEL SYSTEM NORMAL OPERATION (2)

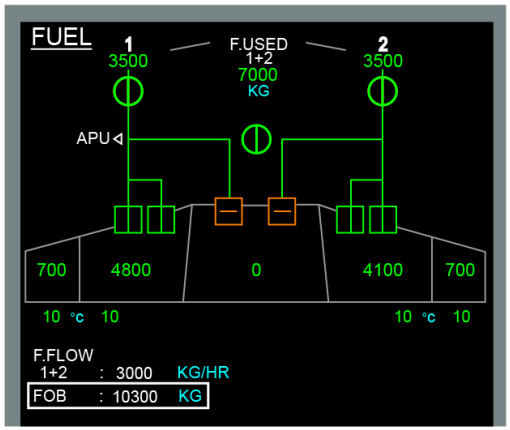
## AUTO FEED FAULT / MANUAL MODE (continued)

### PUMPS OFF

The center tank pump symbols are amber because the pumps have been manually selected OFF.

UGB13131 - U7ST0M0 - UM28P3000000001

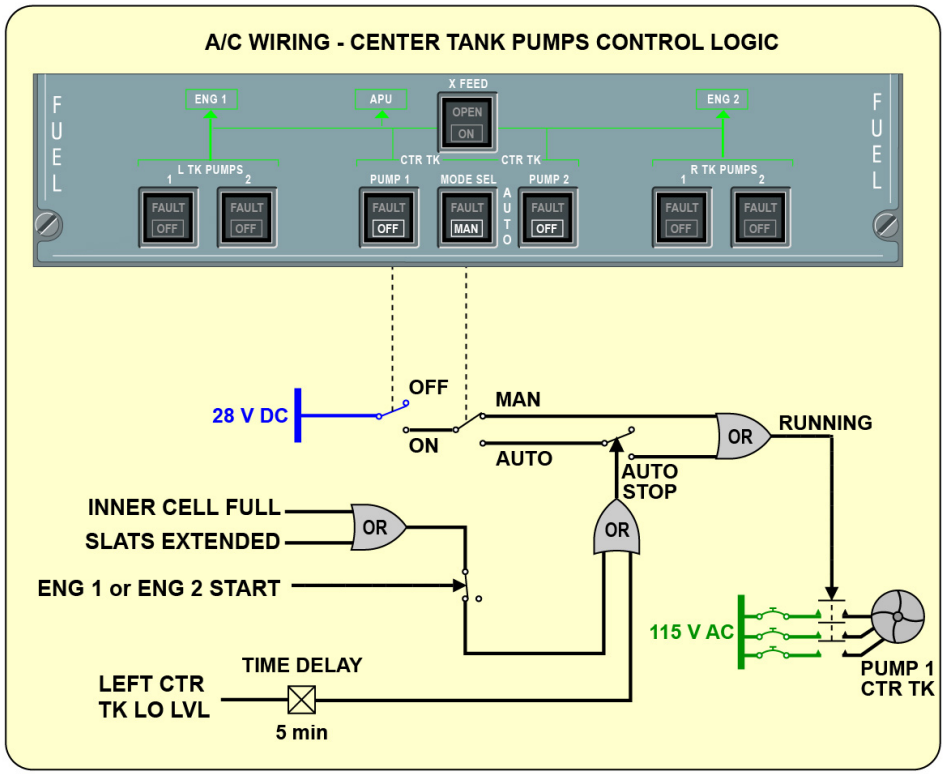
EWD

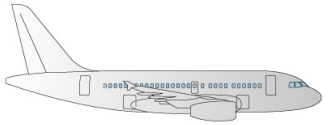



ECAM

(131VU)

(131VU)



AUTO FEED FAULT / MANUAL MODE - PUMPS OFF

# APU FEED SYSTEM D/O (3)

## GENERAL

The APU fuel supply system comprises a fuel pump, a Low Pressure (LP) fuel valve and an actuator on the rear wall of the center tank. The fuel supply to the APU is normally from the Left Hand (LH) crossfeed line. The APU LP fuel shut-off system has a LP fuel valve that controls the supply of fuel to the APU. If an APU fire occurs on ground, the APU emergency shutdown system closes the LP fuel valve to stop the flow of fuel. When the crossfeed valve is open, either engine feed line, left or right, can supply fuel to the APU.

## APU PUMP

The fuel pressure for the APU comes either from the APU fuel pump or the engine fuel pumps. For normal operation, the essential bus bar 801XP (115V AC) supplies the pump motor. When the bus bar is not energized, the static inverter bus bar 901XP (115V AC) supplies the pump motor.

## CANISTERS

The canister permits pump replacement even with fuel in the tanks or in the APU fuel line. When a pump is removed, the fuel pressure closes the canister inlet and outlet.

## PRESSURE SWITCH

The pressure switch controls pump operation. The pressure in the left crossfeed line operates a micro switch. The APU fuel pump stops if the crossfeed line pressure reaches 23.3 psi absolute (1.6 bar) and restarts at 21.7 psi (1.5 bar).

## APU LP SHUT-OFF VALVE

The APU LP fuel shut-off valve is used to isolate the APU fuel supply line from the left engine feed line, when the APU does not operate. The two DC motors in the actuator are supplied from different 28V DC sources.

### VALVE OPEN

The valve opens when:
- the APU MASTER SWitch is set to ON,
- the FUEL VENTilation P/BSW in the APU compartment is pressed and held.

The FUEL VENT P/BSW is used to purge the system during ground maintenance.

### VALVE CLOSE

The valve closes when:
- the ECB powers down after APU shutdown,
- the FUEL VENT P/BSW is released,
- the APU FIRE P/BSW on the overhead panel released out ,
- the APU FIRE SHUT-OFF switch on the panel FWD of the Nose Landing Gear (NLG) bay is operated,
- the fire detection system operates on the ground (APU Emergency Shutdown and APU Auto extinguishing function).

## FUEL VENT P/B

When the A/C is on ground, it is possible to operate the APU fuel pump (single phase 115VAC) to purge the fuel line. The FUEL VENT P/BSW on frame (FR) 80 in the APU compartment is used to operate the pump and to open the LP fuel valve.

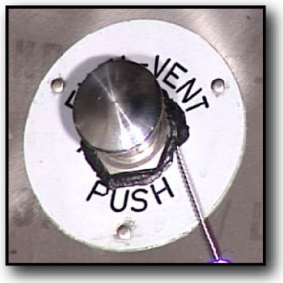
## APU MASTER SWITCH

If the APU MASTER SW P/BSW is pressed ON, the APU pump will operate if the pump inlet pressure is below 21.7 psi (1.5 bar) absolute. This is initiated automatically through the pressure switch.

UGB13131 - U7ST0M0 - UM28D3000000001

## LINE SHROUD AND DRAIN MAST

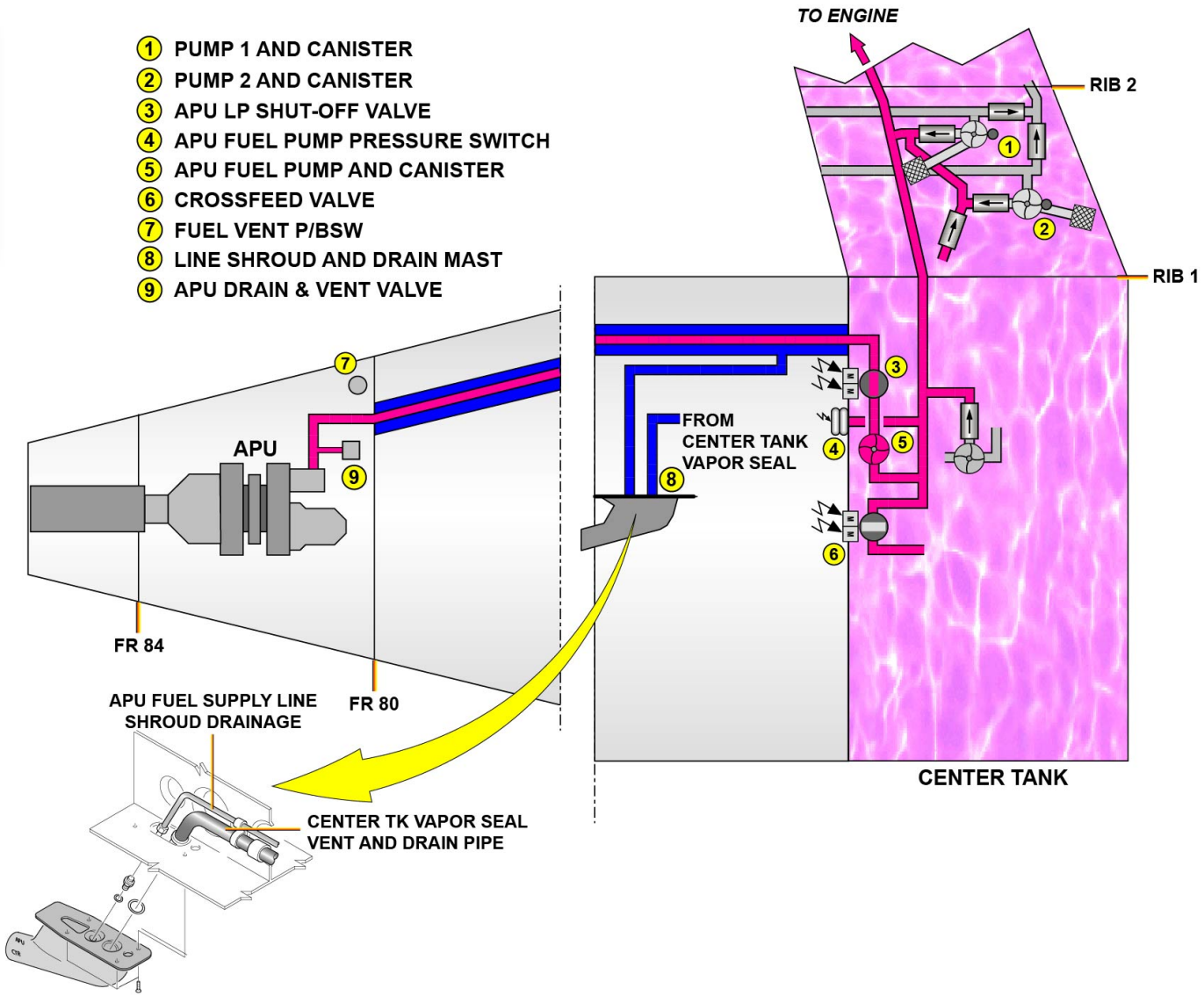
To prevent leaked fuel from spilling into the area of the fuselage (AFT Cargo Compartment, Bilge area, THS Compartment), the APU fuel supply line is shrouded. The shroud is connected to a Drain Mast which is located AFT of the MLG Doors.




(8QC)

1. PUMP 1 AND CANISTER
2. PUMP 2 AND CANISTER
3. APU LP SHUT-OFF VALVE
4. APU FUEL PUMP PRESSURE SWITCH
5. APU FUEL PUMP AND CANISTER
6. CROSSFEED VALVE
7. FUEL VENT P/BSW
8. LINE SHROUD AND DRAIN MAST
9. APU DRAIN & VENT VALVE

(25VU)




GENERAL ... LINE SHROUD AND DRAIN MAST

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UGB13131 - U7ST0M0 - UM28D3000000001

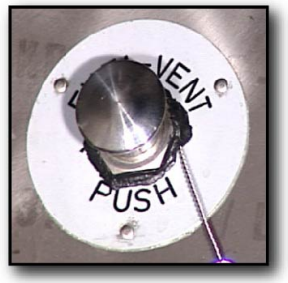
# APU FEED SYSTEM D/O (3)

## OPERATION

### APU MASTER SW OPERATED

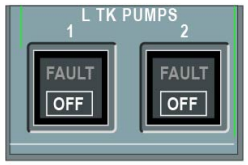
When the MASTER Switch P/B is operated, the blue ON light comes on and the LP Valve opens. The pressure switch monitors the fuel pressure in the APU fuel feed line and operates the APU fuel pump while the fuel pressure is below the threshold.

UGB13131 - U7ST0M0 - UM28D3000000001



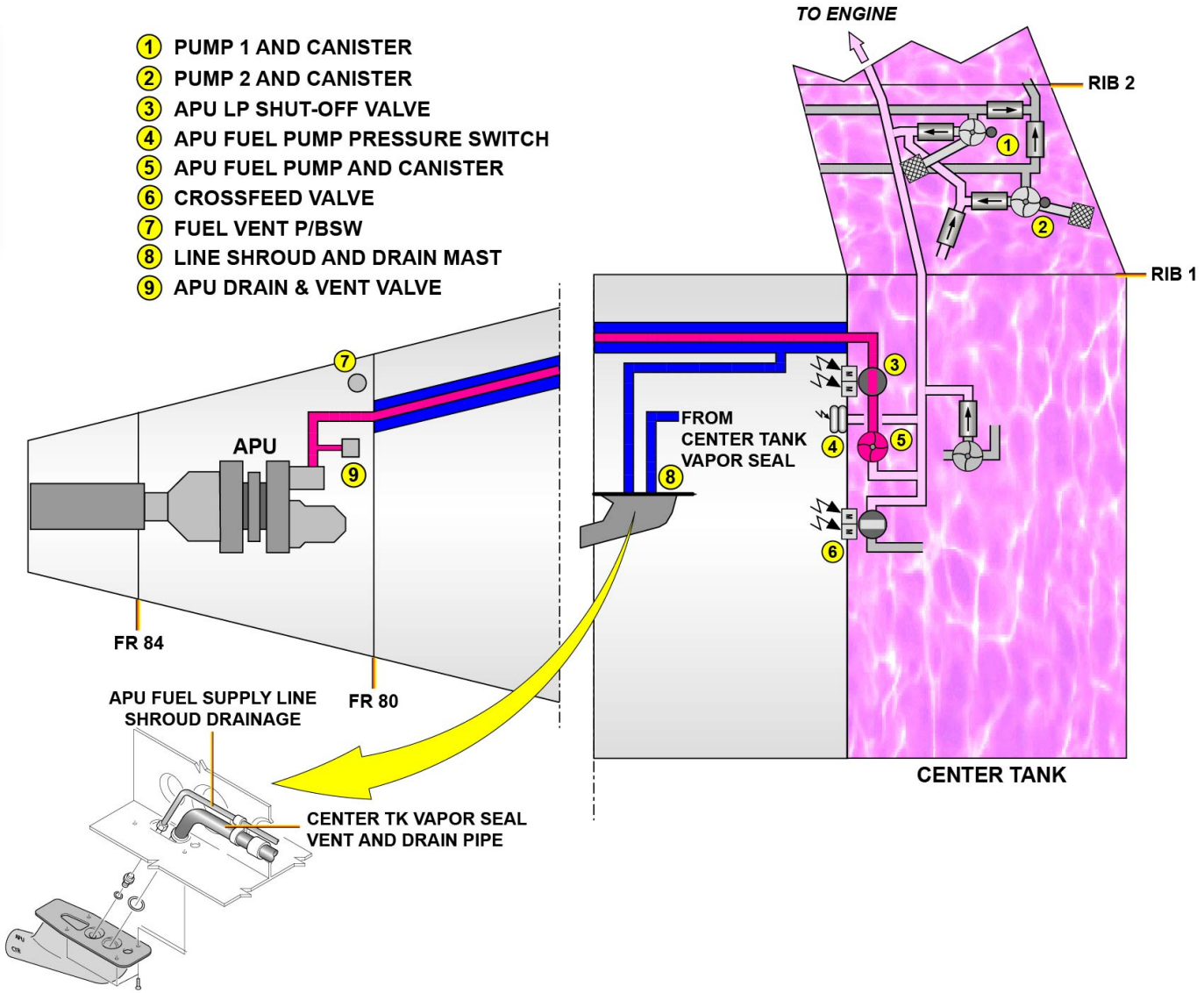

(8QC)

1. PUMP 1 AND CANISTER
2. PUMP 2 AND CANISTER
3. APU LP SHUT-OFF VALVE
4. APU FUEL PUMP PRESSURE SWITCH
5. APU FUEL PUMP AND CANISTER
6. CROSSFEED VALVE
7. FUEL VENT P/BSW
8. LINE SHROUD AND DRAIN MAST
9. APU DRAIN & VENT VALVE




(40VU)

(25VU)




OPERATION - APU MASTER SW OPERATED

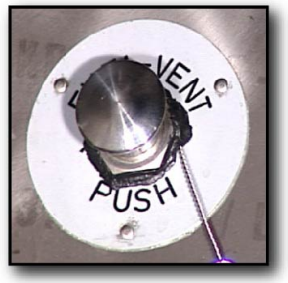
# APU FEED SYSTEM D/O (3)

## OPERATION (continued)

### LH WING TANK PUMP P/B OPERATED

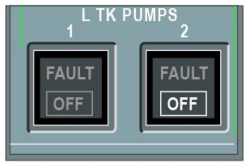
When one (or more) LH wing-tank pump P/B(s) is (are) operated, the white OFF light goes off. The pressure switch monitors the fuel pressure in the APU fuel feed line and stops the APU fuel pump while the fuel pressure is higher than the threshold.

UGB13131 - U7ST0M0 - UM28D3000000001



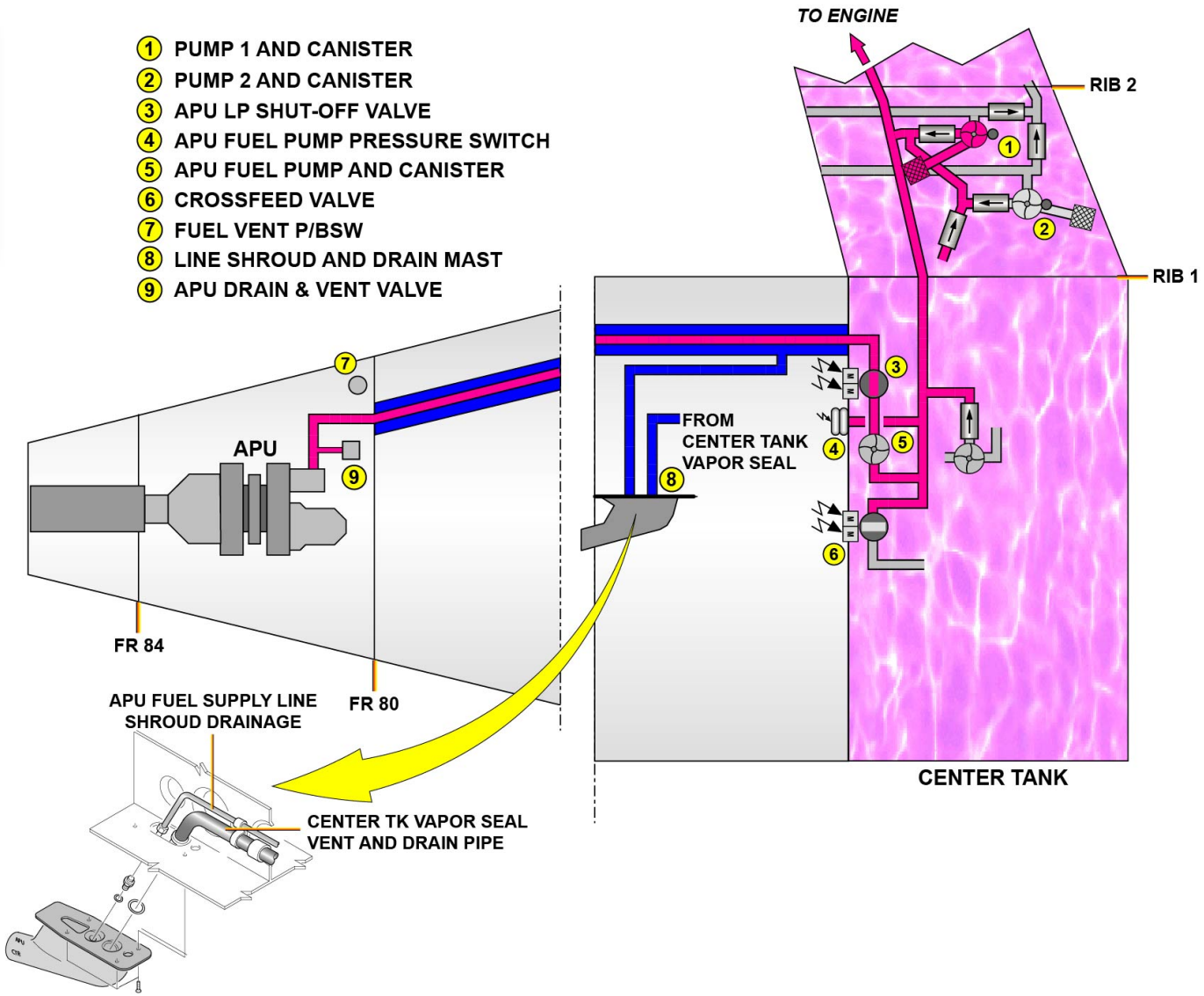

(8QC)

1. PUMP 1 AND CANISTER
2. PUMP 2 AND CANISTER
3. APU LP SHUT-OFF VALVE
4. APU FUEL PUMP PRESSURE SWITCH
5. APU FUEL PUMP AND CANISTER
6. CROSSFEED VALVE
7. FUEL VENT P/BSW
8. LINE SHROUD AND DRAIN MAST
9. APU DRAIN & VENT VALVE




(40VU)

(25VU)



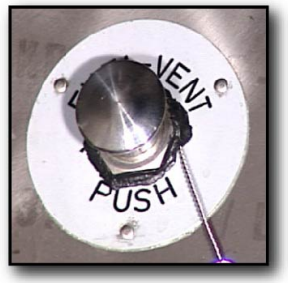

OPERATION - LH WING TANK PUMP P/B OPERATED

# APU FEED SYSTEM D/O (3)

## OPERATION (continued)

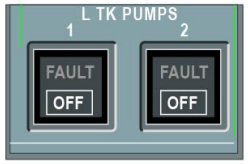
### FUEL VENT P/B OPERATED

When the fuel vent P/B is pushed and held, the APU LP shut-off valve opens and the pressure switch that monitors the fuel pressure operates the fuel pump. The APU fuel line is then drained and open to the air for a short time.




(8QC)

1 PUMP 1 AND CANISTER
2 PUMP 2 AND CANISTER
3 APU LP SHUT-OFF VALVE
4 APU FUEL PUMP PRESSURE SWITCH
5 APU FUEL PUMP AND CANISTER
6 CROSSFEED VALVE
7 FUEL VENT P/BSW
8 LINE SHROUD AND DRAIN MAST
9 APU DRAIN & VENT VALVE
10 DRAIN HOSE & BUCKET

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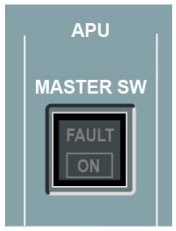


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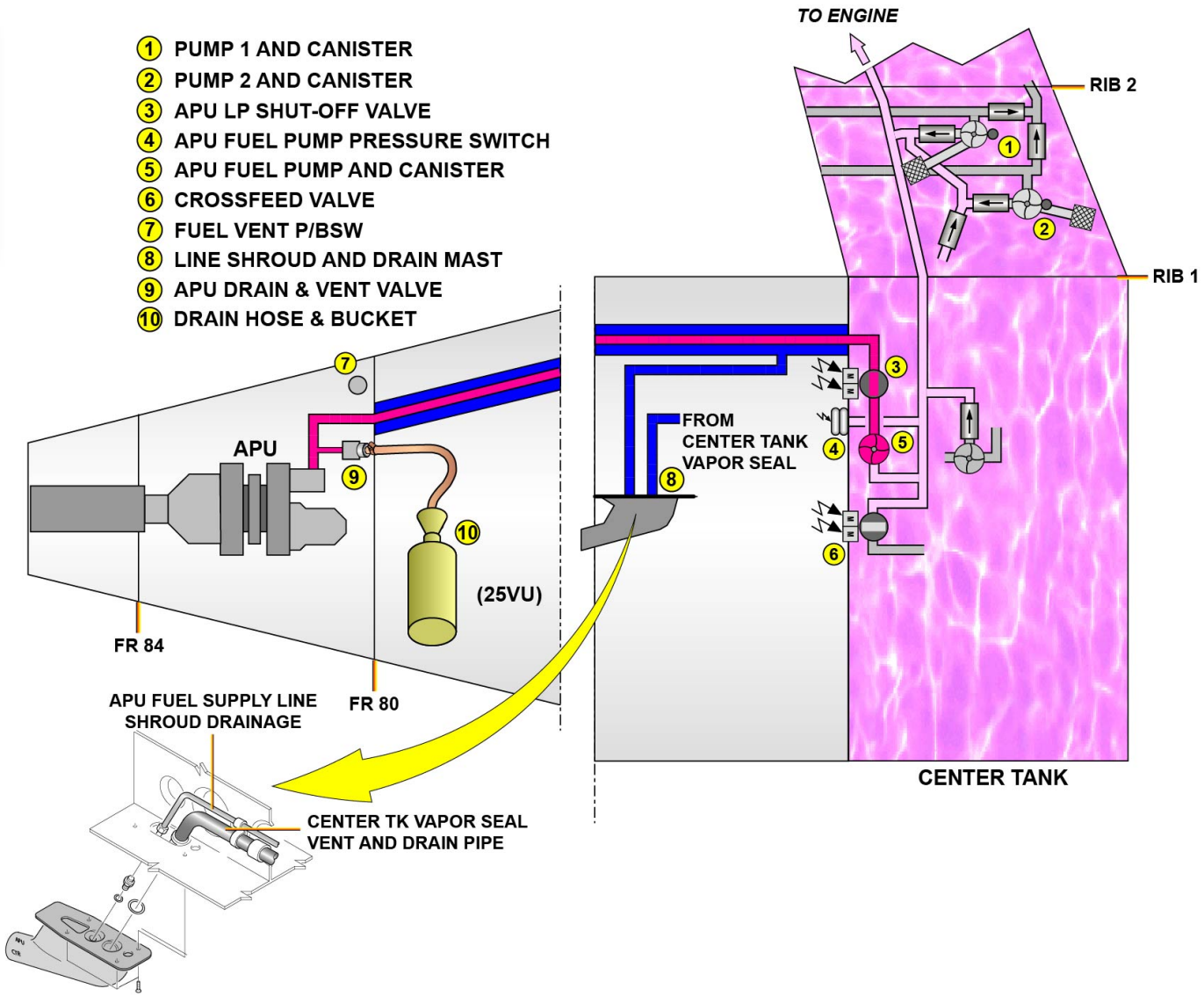



OPERATION - FUEL VENT P/B OPERATED

# REFUEL/DEFUEL CONTROL PANEL PRESENTATION (2)

## MULTI-TANK INDICATOR

The multi-tank indicator displays the quantity of fuel in each wing and in the center tank.

## HIGH LEVEL LIGHTS

A blue HIgh LeVeL light for each tank comes on when the associated high level sensor is covered. The related refuel valve will close.

## REFUEL VALVE SELECTOR

There is one refuel valve selector per tank. For an automatic refueling, these refuel valves selectors remain in the NORMal position. For the defueling, the valves will not open. When the selector is set to OPEN, the refuel valve operation depends on the MODE SELECTor position. With the MODE SELECT in the REFUEL position, each refuel valve closes when the associated high level is reached. When the REFUEL VALVES selector is set to the SHUT position, the refuel valve is closed. This is independent of the MODE SELECT position.

## MODE SELECTOR

With the MODE SELECT at OFF, the refuel valves are closed. When the MODE SELECT is set to REFUEL, the refuel valves operate automatically or manually depending on the position of the refuel valve selectors. For defueling or transfer of fuel the MODE SELECT is set to DEFUEL/XFR. It opens the defuel/transfer valve.

## OPEN LIGHT

The amber OPEN light comes on when the MODE SELECT is set to DEFUEL/XFR. It confirms the opening of the defuel/transfer valve.

## TEST SWITCH

When the TEST switch is set to the HI LVL position, the HI LVL lights come on if the high level sensors and their circuits are serviceable. A filament test is done when the TEST switch is set to LighTS. All the panel lights come on and all quantity indications show 8s.

## PRESELECTED

When automatic refueling, the fuel quantity taken aboard is governed by the setting on the PRESELECTED display.

## ACTUAL

The ACTUAL total quantity indication shows the amount of fuel on board.

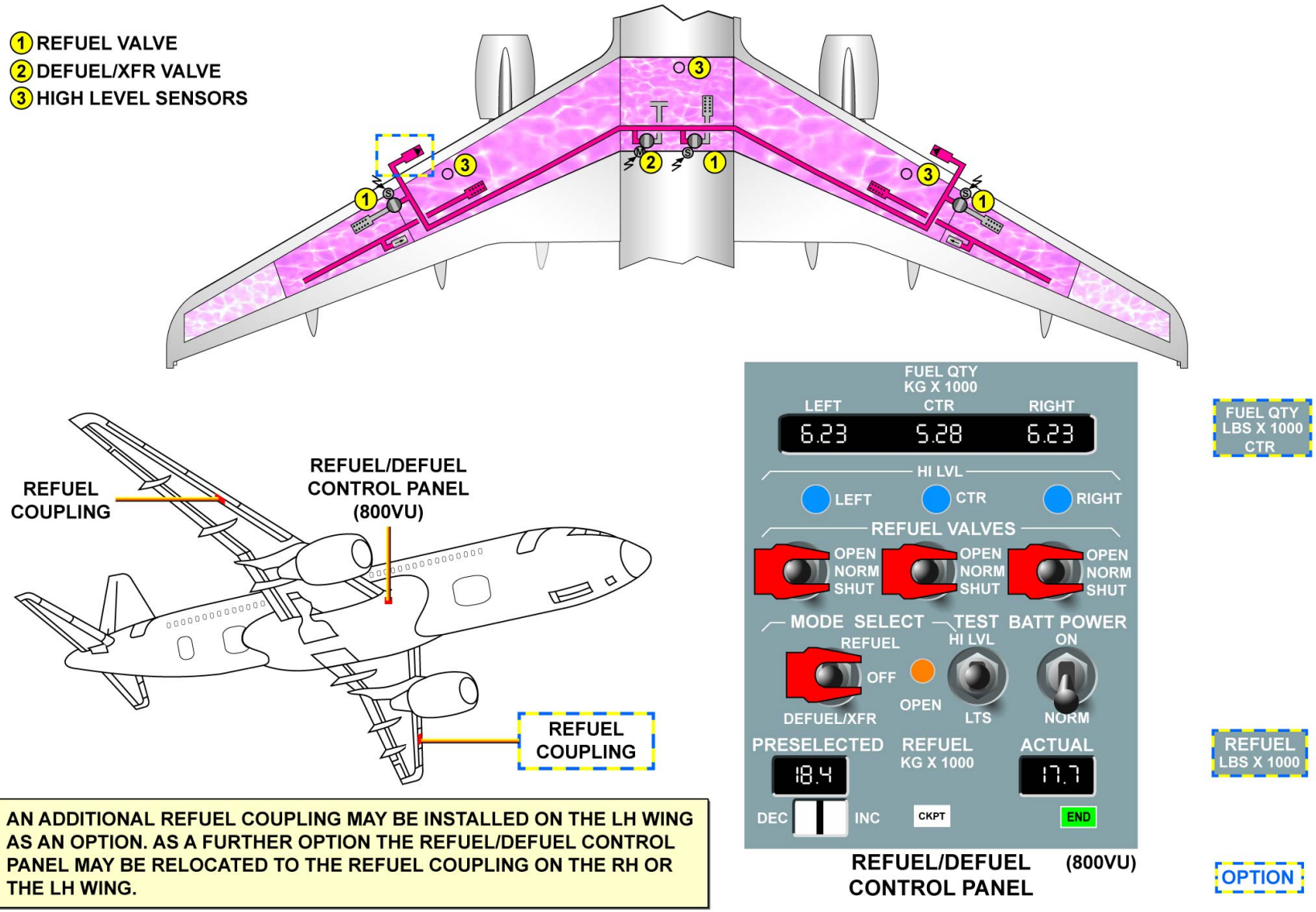
## ROCKER SWITCH

The desired fuel figure of the pre-selector is obtained by tripping the rocker switch to decrease or increase.

## END LIGHT

The green END light comes on when automatic refueling is complete. It flashes in case of incorrect fuel pre-selection or when automatic refuel operation has stopped for any reason other than completion of normal operation.

UGB13131 - U7ST0M0 - UM28P400000001




MULTI-TANK INDICATOR ... END LIGHT

# COCKPIT PRESELECTOR PRESENTATION (OPTION) (2)

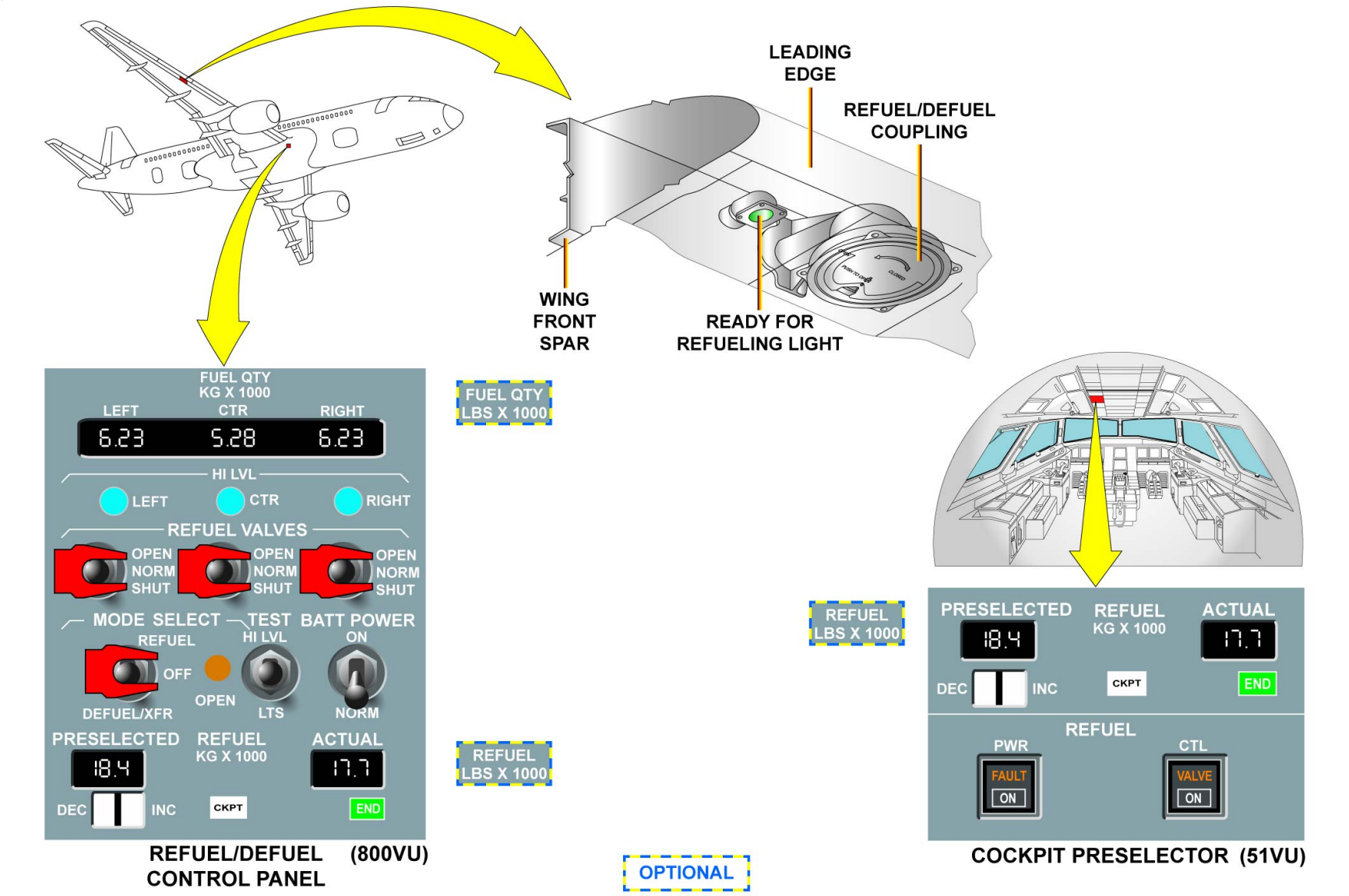
## GENERAL

The basic refuel/defuel system of the A/C is controlled from the belly fairing refuel/defuel control panel.

## OPTIONAL FUEL QUANTITY PRESELECTOR IN FLIGHT COMPARTMENT

Optionally, the refueling operation can also be controlled from the cockpit via the cockpit refuel/defuel control panel. From this preselector, the aircrew can set the required quantity of fuel and initiate automatic refueling operation. This cancels any fuel quantity set on the belly fairing refuel/defuel control panel. When the required fuel quantity is set on the cockpit preselector, the ready for refueling light, located on the RH wing adjacent to the refuel coupling, comes on.
When the PoWeR P/BSW is pushed, the ON light comes on, and the refueling circuits are energized. The white CocKPiT light also comes on, on the preselector panel in the cockpit and on the external refuel/defuel control panel. When the high level sensors fail, refueling is stopped and the FAULT light on the PWR P/BSW comes on.
The refuel valves switches on the belly fairing refuel/defuel control panel are in the NORM position and the PWR P/BSW pushed. When the ConTroL momentary action P/BSW is pushed, the ON light comes on, and refueling is controlled from the cockpit preselector. There is no need to operate the external refuel/defuel control panel. If the refuel valves switches are not in the NORM position on the belly fairing refuel/defuel control panel, the VALVE amber light comes on.

UGB13131 - U7ST0M0 - UM28P500000001




GENERAL & OPTIONAL FUEL QUANTITY PRESELECTOR IN FLIGHT COMPARTMENT

UGB13131 - U7ST0M0 - UM28P500000001

# REFUEL/DEFUEL SYSTEM D/O (3)

## GENERAL

The refuel/defuel system controls the fuel flow into or out of the A/C. Automatic refueling, manual refuel, defuel or ground transfer are controlled from the refuel/defuel control panel, installed on the belly fairing. A refuel/defuel coupling, also installed in the leading edge of the wing, is the interface between the refuel/defuel system and the external fuel source. Wing tank gravity refueling is possible. To fill the fuel tanks to their maximum capacity, the A/C must be level. During an automatic refueling, the refueling of each fuel tank is controlled by the FQI computer. The main fuel pumps are used to defuel the A/C. The defuel/transfer valve and the crossfeed valve must be open.

## REFUEL/DEFUEL CONTROL PANEL

The primary components on the refuel/defuel control panel are:
- the control panel,
- the fuel quantity PreSELector,
- the fuel quantity indicator.

When the quick release door of the refuel/defuel control panel is opened, it operates a micro switch, which sends a signal to the FQI computer and connects the 28V DC supply to the refuel/defuel electrical circuits.

## REFUEL/DEFUEL COUPLING

The refuel/defuel coupling supplies the wing tanks and the center tank. When not in use, the coupling is fitted with a pressure-blanking cap. The refuel/defuel coupling has a standard 2.5 inch adaptor flange. The coupling ring has a breakaway groove around its circumference. This prevents damage to the A/C structure if a sideways force is applied.

## REFUEL VALVE AND REFUEL GALLERY

Each refuel valve, one per tank, is the interface between the refuel gallery and the related fuel tank. The valve is controlled by a solenoid which, when energized and a refuel pressure is supplied, opens the valve. The refuel gallery is a fuel line that connects all the refuel valves together.

## SPILL PIPES

During a refuel operation, the outer cell is filled first. When it is full, fuel flows into the inner cell through the spill pipe which connects the two cells together.

## DIFFUSERS

The diffusers, installed on refuel lines, diffuse fuel into the tanks with minimum turbulence and electrostatic build-up.

## AIR INLET AND DRAIN VALVES

The air inlet valve lets air into the refuel gallery after refueling. Thus fuel can drain from the refuel gallery through the fuel drain valve. A pipe extends from the air inlet valve to the outboard side of rib 21. This pipe makes sure that the air inlet remains above the fuel level at all times. This stops the movement of fuel from one wing tank to another by gravity. The fuel drain valves are closed by fuel pressure in the refuel gallery. When the pressure source is removed, the valve opens to allow fuel to drain from the refuel gallery into the wing tank.

## DEFUEL/TRANSFER VALVE

The defuel/transfer valve connects the main fuel pump system to the refuel gallery. When open, the valve permits the fuel in the main fuel pump system to be moved into the refuel gallery. The valve is controlled by the MODE SELECT toggle switch on the refuel/defuel control panel.

## PRESSURE RELIEF VALVE

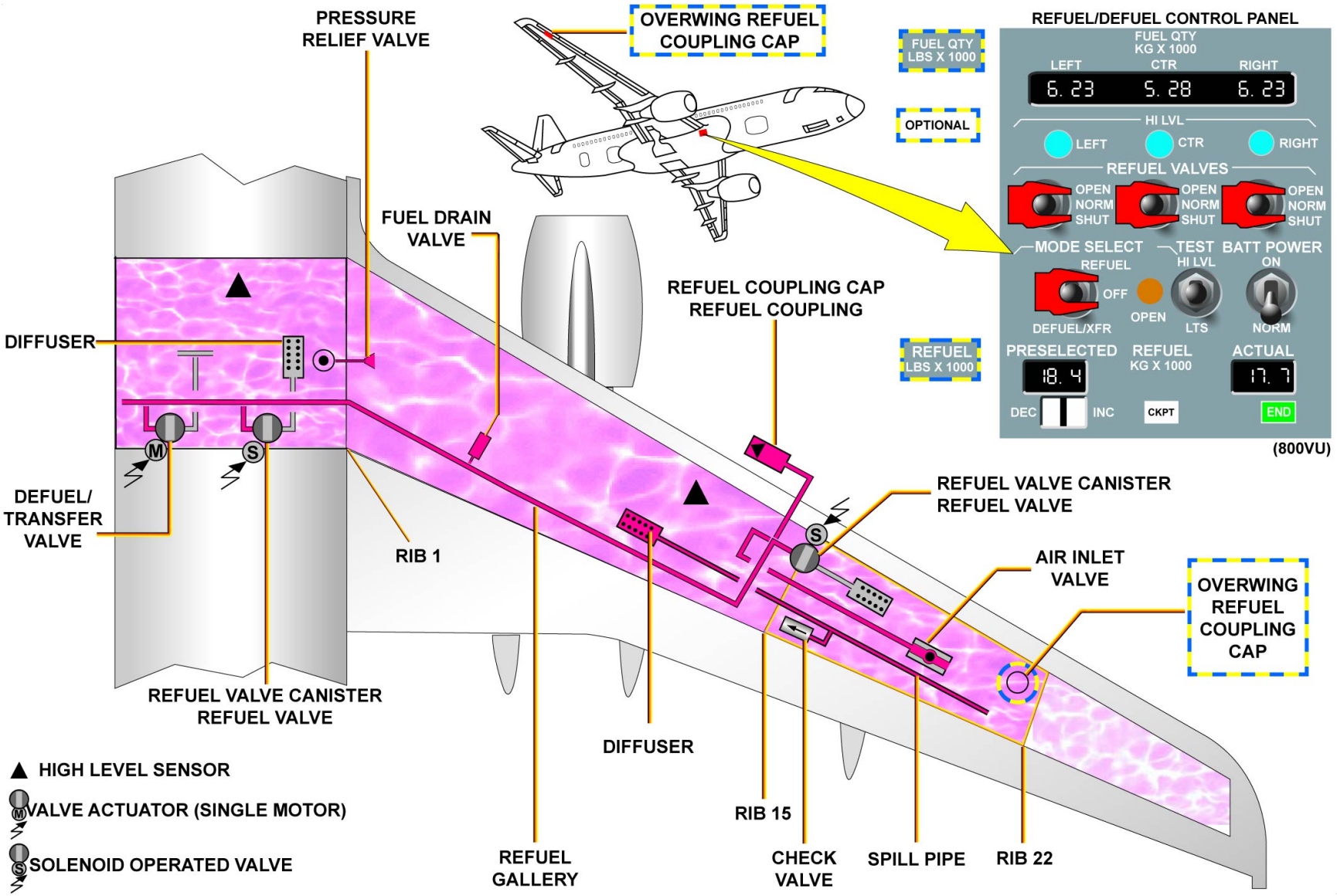
The pressure relief valve releases fuel into the RH wing tank if a center tank overflow occurs.

## HIGH LEVEL SENSOR

One high level sensor is installed in each tank. When the high level sensor is immersed in fuel, the Fuel Level Sensing Control Unit (FLSCU) receives this state, amplifies this signal to control the refuel valve to close.

## OVERWING REFUELING POINTS (OPTIONAL)

As an option, each wing tank has an overwing refuel point installed in the upper wing surface, to refuel the A/C when a pressure refuel source is not available. During an overwing refuel, the fuel only goes into the wing tank. It is then necessary to do a fuel transfer to get the fuel into the correct fuel-load configuration.




GENERAL ... OVERWING REFUELING POINTS (OPTIONAL)

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# AUTOMATIC REFUEL OPERATION (2)

## PREPARATION

Put the Flaps and Slats into the 0 position.
Fire Fighting Equipment must be located near the aircraft.
Make sure that the chocks do not touch the tires.
Make sure that the aircraft and the fuel tanker are grounded correctly.
Make sure that the coupling of the fuel supply- hose is clean, then connect it to the aircraft refuel coupling.

NOTE: Note: that the nominal refueling pressure is 50 psi per square inch, i.e. 3.45 bar.

CAUTION: If, as an option, a second refuel/defuel coupling is installed, only one refuel/defuel coupling should be used at a time.

PREPARATION

# AUTOMATIC REFUEL OPERATION (2)

## TEST OF THE REFUEL/DEFUEL CONTROL PANEL

The refuel/defuel control panel 800VU is located in the RH fuselage belly fairing.
Open the fuel control Panel.
First, start with the Light test and push the switch in the light test position.
Now all the lights must go on.
The second test is the high level test.
Push the switch in the High Level position and all the high level lights must come on.
Make sure that the Refuel Valves switches are in the Normal Position

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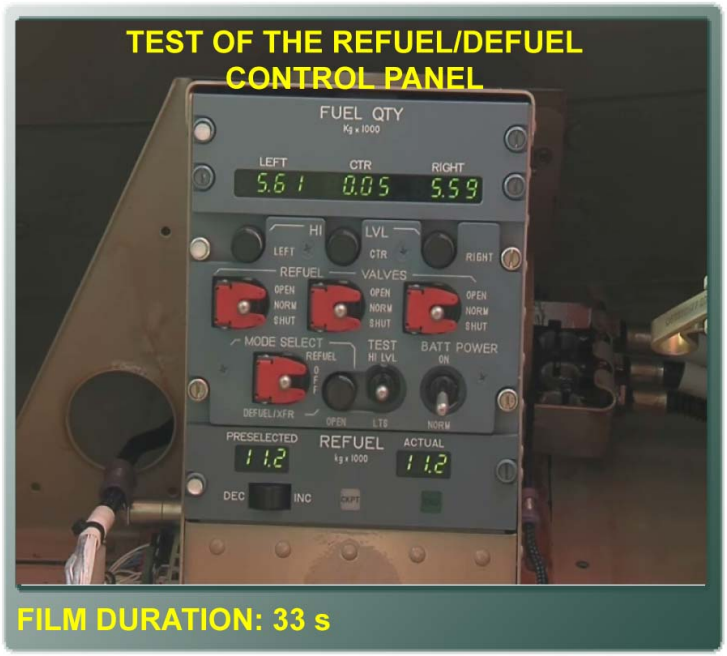


TEST OF THE REFUEL/DEFUEL CONTROL PANEL

# AUTOMATIC REFUEL OPERATION (2)

## AUTOMATIC REFUELING

On the Preselector, put the Rocker switch to the increase position and hold it there.
When the Preselected display shows the necessary fuel load, release the Preselected rocker switch.
On the refuel/ defuel control panel, put the Mode Selector switch in the Refuel position.
Start the pump on the fuel tanker Unit and make sure that the numbers on the Actual Display increase.
When the refuel operation is complete, make sure that the End light comes on.
Stop the pump on the fuel Tanker and put the Mode Selector switch to the OFF and guarded Position.

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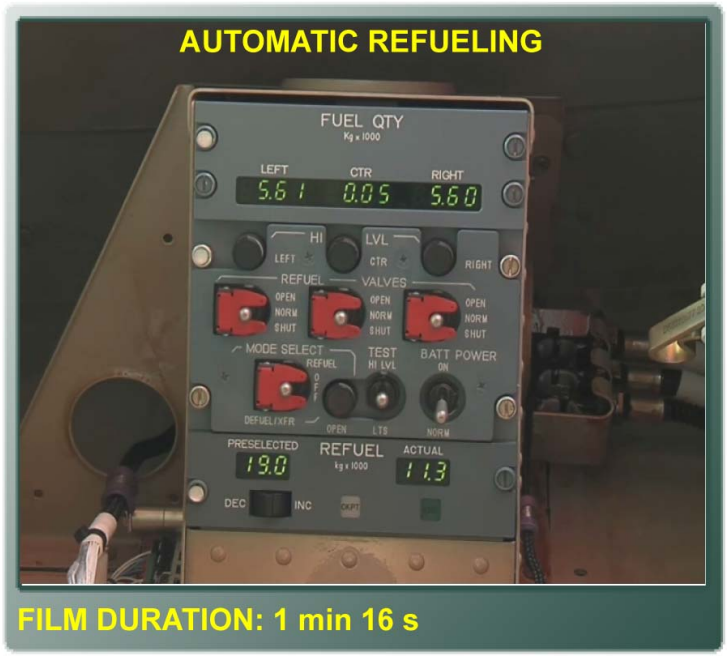


AUTOMATIC REFUELING

# AUTOMATIC REFUEL OPERATION (2)

**CLOSE-UP**

Disconnect the Coupling and clean the Area.

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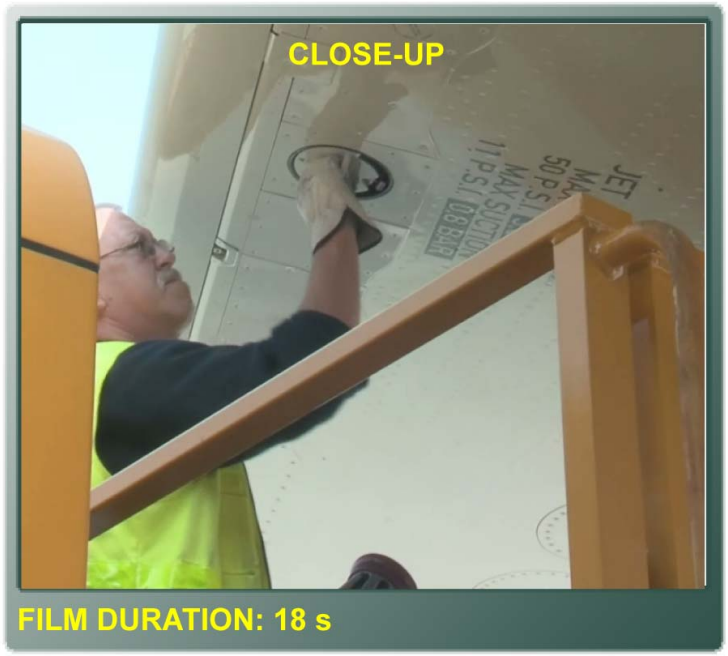



CLOSE-UP

# FUEL QUANTITY INDICATING (3)

## GENERAL

The Fuel Quantity Indicating (FQI) is a computerized capacitance type system.
The system mainly gives:
- fuel mass/temperature measurement and display,
- control of automatic aircraft refueling,
- system integrity monitoring using BITE,
- ARINC 429 digital data for interface to other systems.

## FQIC

The Fuel Quantity Indication Computer (FQIC) does the fuel mass calculations and controls the whole system by using various interfaces. The FQIC has two identical channels. Each channel calculates the tank quantities and monitors the status of the other channel. The healthiest channel is in control. If one channel fails, the system operates normally, but the ECAM will indicate a failure warning on the upper Display Unit (DU) as well as the Centralized Fault Display System (CFDS) report will indicate the failure.

## PROBES

A set of capacitance probes in each tank sends a signal to the computer in relation to the fuel level in the tank. There are 5 probes in the center tank and 14 per wing tank. 2 probes are inside the optional Additional Center Tank. A single probe failure does not affect the system indication. In each tank inner cell, fuel probe No. 2 and in each outer cell fuel probe No. 13 have diodes that give the fuel temperature to the FQIC for indication on the ECAM system display.

## CAPACITANCE INDEX COMPENSATOR

One probe with a Capacitance Index Compensator (CIC) is installed inside each tank such that under normal operational conditions it is always fully submerged in fuel and thus the permittivity of the fuel can be determined. The Capacitance Index Compensator has a capacitance in proportion to the dielectric constant of the fuel. The capacitance value is a result of the density of the fuel between the plates. The fuel density changes with temperature and type of fuel. In the case of cadensicons failure, the fuel mass can be calculated from a density value as assumed from the dielectric constant value. This standard dielectric constant value depends on the type of fuel and fuel temperature.

## CADENSICONS

The cadensicons give a signal to the computer in proportion to the density and the dielectric constant of the fuel held in each tank. The fuel mass is calculated from this density value.

## FLSCU

The Fuel Level Sensing Control Units (FLSCU) are mainly used:
- to shut the related refuel valve when the high level is reached in each tank,
- to start the BITE test of the high level sensors and their related circuits, by using the TEST switch on the refuel/defuel control panel.
High-level sensors in each tank send a signal to the FQIC, via the FLSCU. The test is started via the FQIC and the FLSCU. Sensor and system status is sent from the FQIC to the CFDS.

## REFUEL/DEFUEL CONTROL PANEL

The FQIC sends automatic shut-off indication at a preselected refuel quantity. When the MODE SELECT switch on the refuel/defuel control panel has been set to the REFUEL position, the FQIC first makes sure that it is physically possible to transfer the preselected fuel quantity from tank to tank.Throughout the automatic refuel operation the FQIC monitors the density of fuel in each tank and the distribution of the load.

### MTI

A Multi Tank Indicator (MTI) displays the fuel quantity in each tank.

### FWC

The FWC sends the audible warning and the MASTER CAUT light comes on.

### PRESELECTOR

The pre-selector shows the pre-selected and actual total fuel quantities, as monitored by the computer.

### LGCIU 1

The FQIC receives the left and right L/G compressed information from Landing Gear Control and Interface Unit (LGCIU) 1.

### L/G CONTROL LEVER

The FQIC receives ground information from the L/G when selected DOWN with the aircraft on jacks. This signal is used to supply electrical power to the FQIC in this specific configuration.

### ADIRS

Acceleration data is received from the Air Data/Inertial Reference System (ADIRS) during flight and is used as an alternate source of attitude. Normally, effects of attitude, changes in acceleration, effective pitch and roll angles, are calculated from the height of fuel at each probe and the knowledge of the tank geometry stored in the computer memory.

### CFDS

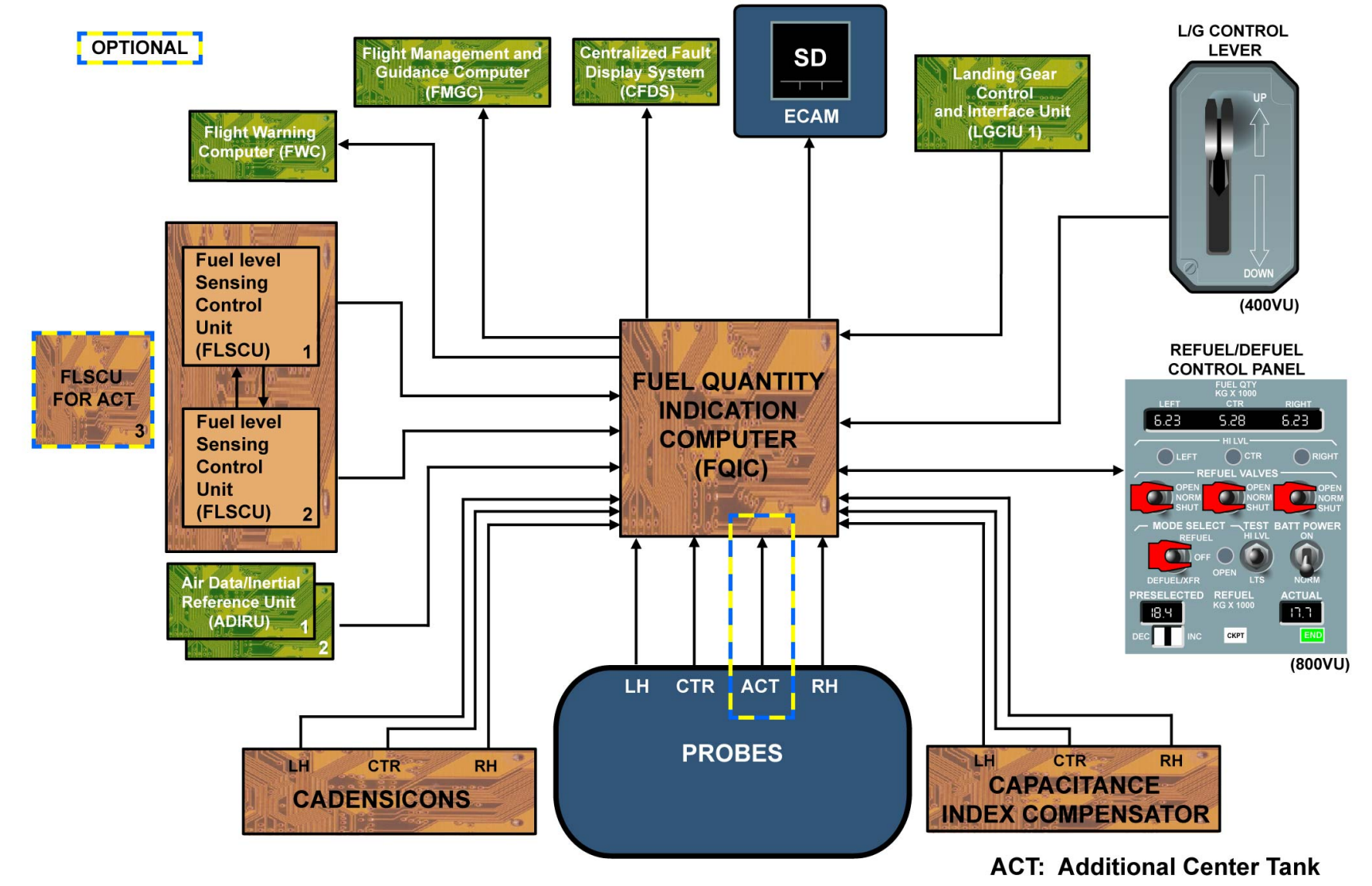
ARINC 429 output links transmit BITE information from the computer to the CFDS. The CFDS monitors fault conditions and BITE.

### FMGC

Fuel parameters are sent to the Flight Management and Guidance Computers (FMGCs), for navigation computations.

### ECAM

Total and individual tank fuel mass information is sent to the ECAM for display.




GENERAL ... ECAM

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# FUEL QUANTITY INDICATING (3)

## OPERATIONAL PRINCIPLE

In each tank the density of the fuel is measured by using a cadensicon, which measures only its respective tank.
The signals have a continuous 30 seconds time average applied to remove fluctuations.
If the cadensicon signal is not available or invalid (all failed or out of range in water) the Capacitance Index Capacitor (CIC) signal is used.
One probe has a CIC at its lower end. The CIC has a specific function:
- to measure the dielectric constant, because most of the time it is fully covered by remaining fuel in tank.

The FQIC uses the dielectric constant to calculate the fuel volume in the tanks.
The electrical capacitance of each probe is proportional to the height of fuel around the probe. One CIC probe is positioned in the tank (always fully submerged in fuel under normal operational conditions) measuring the permittivity of the fuel (K, also called the dielectric).
A separate component called Cadensicon (on A318, A319 & A320) or, Ultracomp and Dualcomp (on the A321) is used to measure the density of the fuel.
With fuel height and permittivity data, the volume of fuel in the tank (cell) is determined. When combined with the fuel density information the mass of fuel is calculated by the FQIC.

NOTE: Non-constant temperature basically changes the Density and Permittivity.

In normal operation the FQIC calculates the mass of fuel with an accuracy of 1%.
In back-up operation, if density information is lost, once the volume of fuel in the tank (cell) is determined, the fuel density is assumed from the Dielectric characteristic (K) as per the chart. The "Block FUEL" is calculated by the FQIC, but with a reduced accuracy (less than 3% to 4%).

NOTE: The ECAM displays the Fuel on Board (FOB) with two amber dashes as a degraded display, as long as the accuracy is not degraded beyond 5%.

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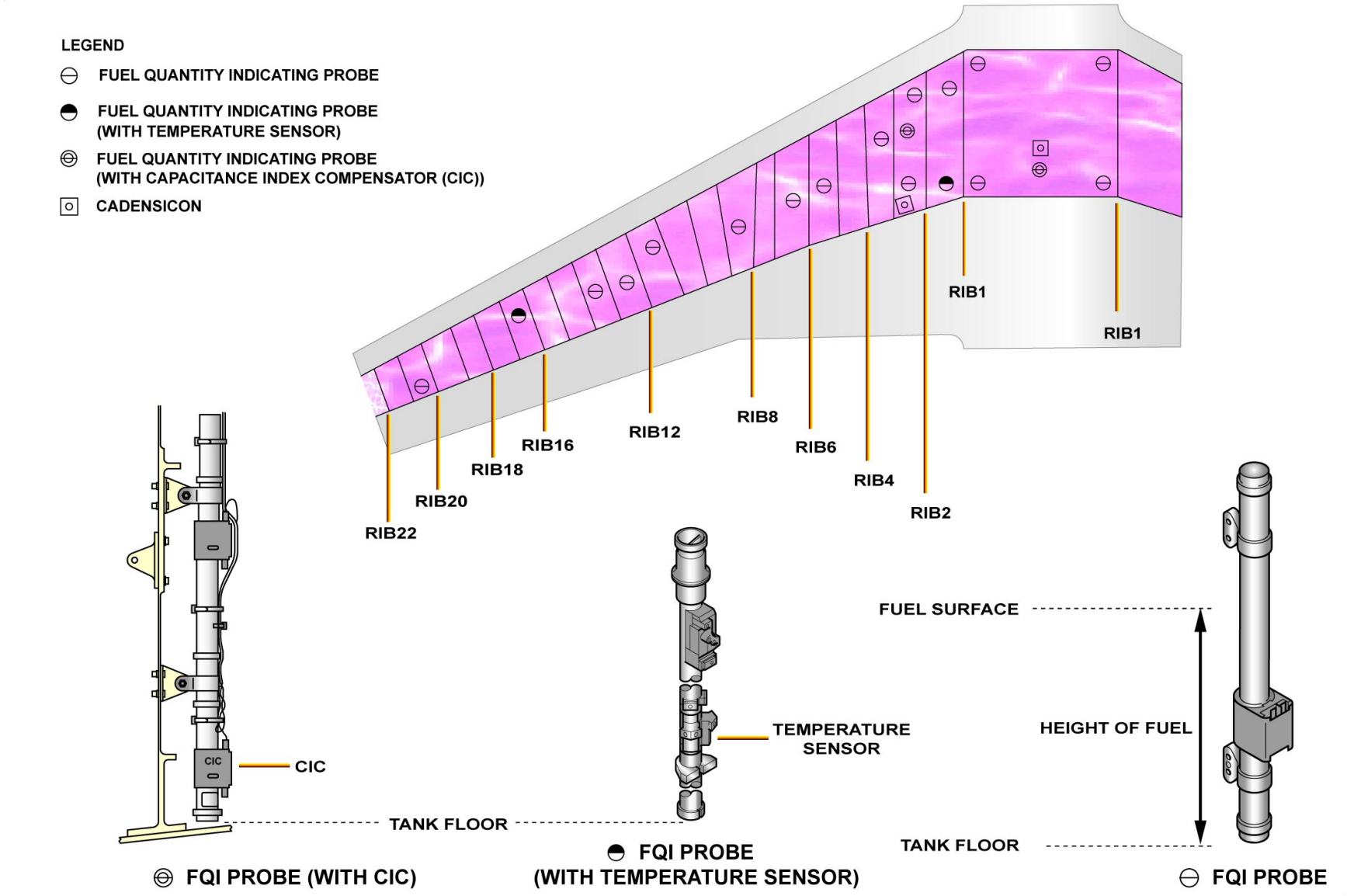
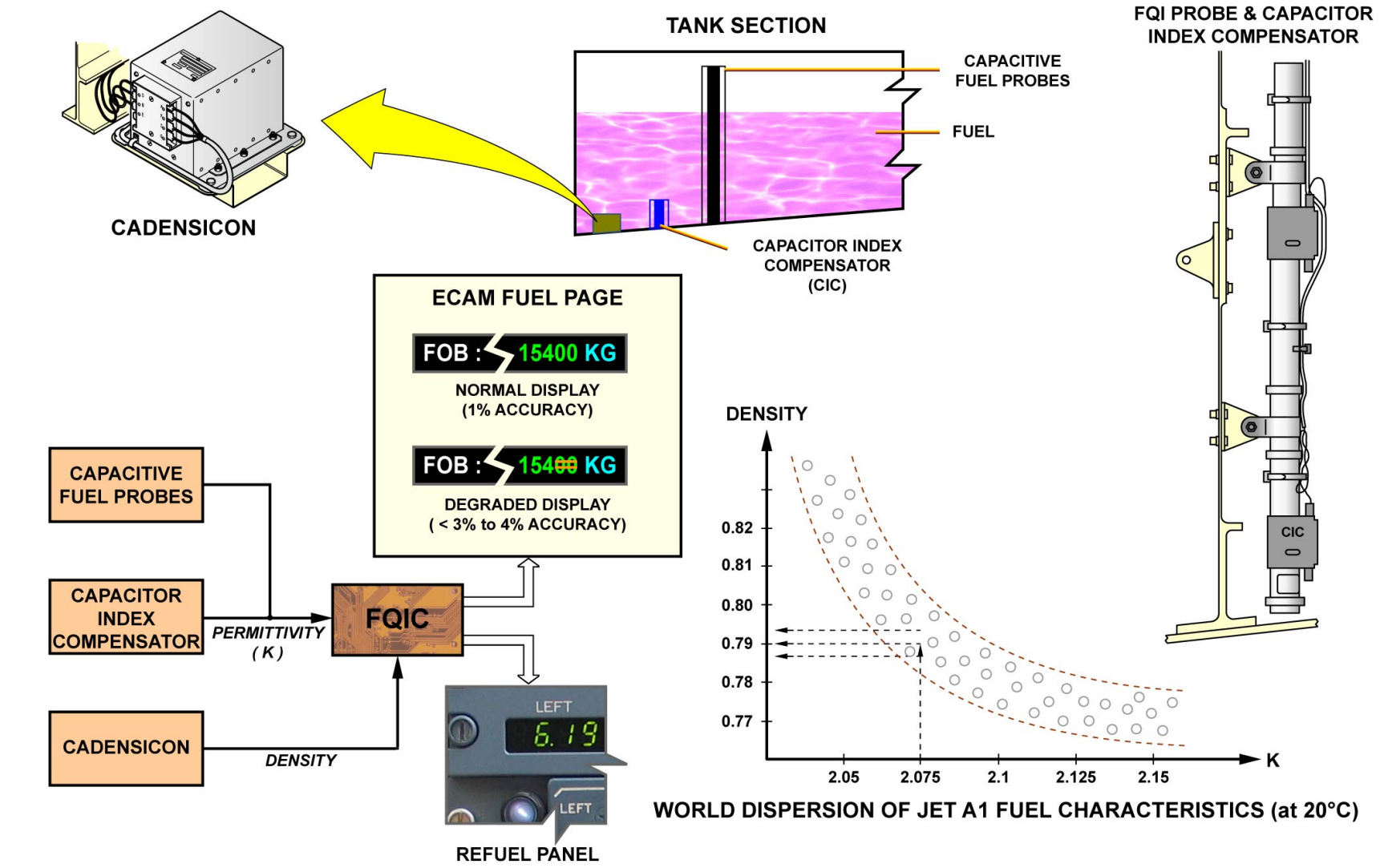



OPERATIONAL PRINCIPLE




OPERATIONAL PRINCIPLE

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# FUEL LEVEL SENSING (3)

## B2 SCOPE

CAUTION: MODULE TAGGED B2 SCOPE.
BE AWARE THAT ONLY AVIONICS/ELECTRICAL TOPICS SHOULD BE LEARNED FOR A T2 COURSE.

## GENERAL

The aircraft is equipped with two multi-channel Fuel Level Sensing Control Units (FLSCU) and a third one, if the Additional Center Tank (ACT) is installed. They provide high fuel level sensing, low fuel level sensing, full fuel level sensing, underfull fuel level sensing, overflow level and temperature sensing. Fuel level and temperature sensors feed signals to the multi-channel amplifiers. The FLSCU detect and amplify the signals and trigger switching functions in the appropriate circuits.

## HIGH LEVEL

The FLSCUs use signal conditioning to independently monitor the high level sensors.
When the high level sensor in the fuel tank becomes wet, the FLSCUs will give a output to:
-close the related refuel valve
-cause the related HI LVL light to come on at the refuel panel

## LOW LEVEL

A signal is given to the time delay relays when a center tank LOW LVL sensor becomes dry. When the LOW LVL sensor has been dry for five minutes, the related center tank pump is latched off.
3 low level sensors at a fuel level of 750 Kg (1653 lbs) in each wing tank are used for:
- opening of the Intercell Transfer Valves simultaneously in both wing tanks when exposed to air the first time.
- generating the wing tank low level warning on ECAM when exposed to air for more than 30s.

## FULL LEVEL

A center tank pump will stop when the two FULL LVL sensors in the related wing tank are wet. The pump will not operate again until at least one UNDERFULL LVL sensor in the related wing tank is dry. The related center tank LOW LVL sensor must also be wet for the pump to restart.

## UNDERFULL LEVEL

The full and underfull level sensors are installed in the wing tanks. The FLSCU use the full and the underfull level sensor data to control the automatic operation of the center tank fuel pumps. This controls the wing tank fuel level.
Data from the full level sensor is used to make sure the fuel level (in the wing tank) does not increase above the full mark.
Data from the underfull level sensor is used to make sure that the fuel level (in the wing tank) does not decrease to less than 500 kg (1100 lb) below the full mark (with fuel in the center tank).

## OVERFLOW LEVEL

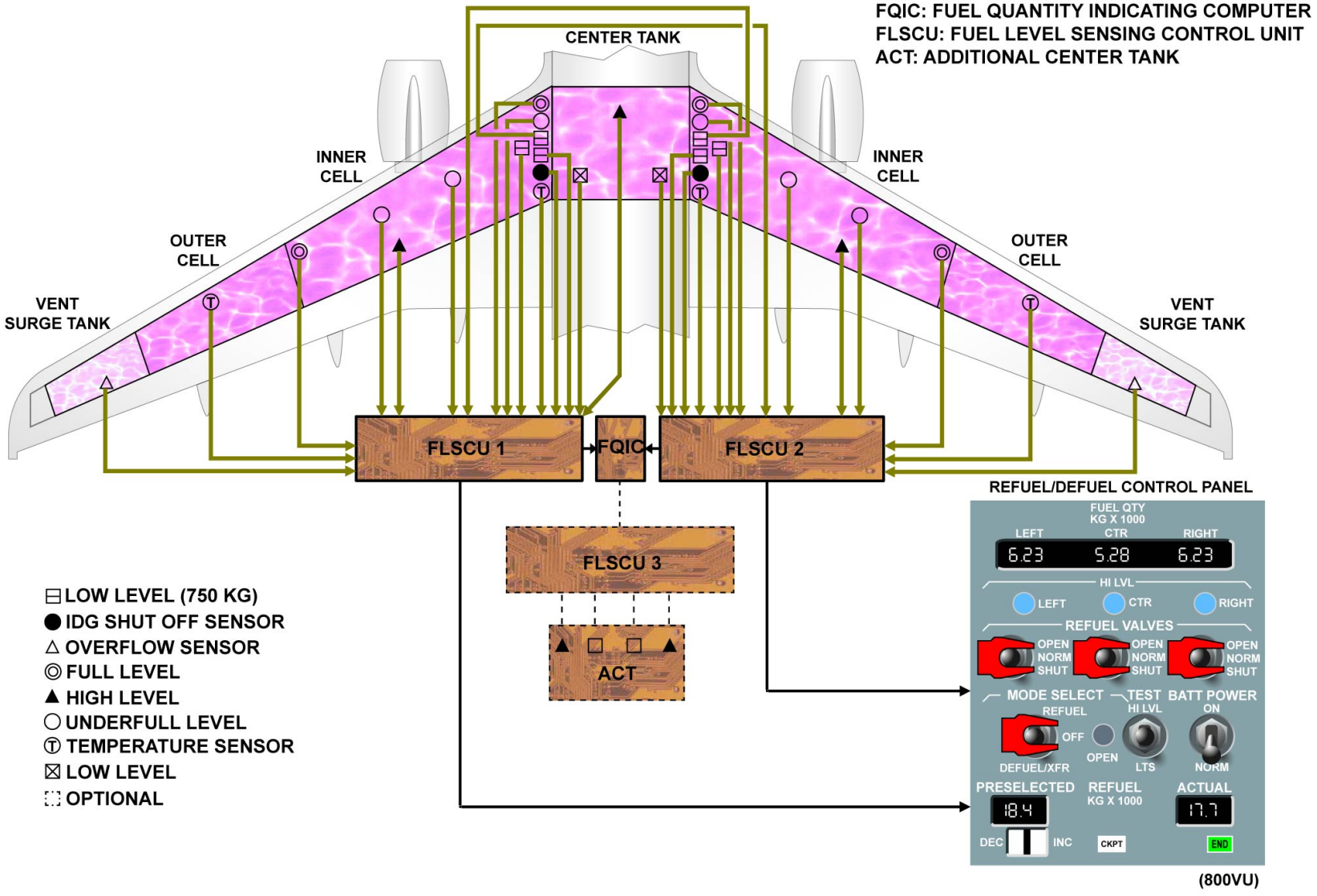
If the center tank pump fails to stop with inner cell full level reached, the overflow sensor sends a signal, via the FLSCU, to the Engine Interface Unit (EIU) to close the Fuel Return Valve (FRV).

## TEMPERATURE SENSOR

The fuel temperature sensor in the wing tank inner cell sends a high fuel signal temperature signal 52.5°C (126.5°F).
The fuel temperature sensor in the wing tank outer cell sends a high fuel signal temperature signal 55°C (131.0°F).

## IDG SHUT-OFF SENSOR

When the IDG shut-off sensor is dry (280 Kg) the FLSCU signals the fuel return valve to close. This stops the fuel recirculation system, to prevent an increase in the amount of unusable fuel in the wing-tank. The IDG shut-off sensors stop the IDG cooling when the fuel quantity is less than 280 Kg (616lbs).




B2 SCOPE ... IDG SHUT-OFF SENSOR

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# FUEL SYSTEM OPERATION, CONTROL & INDICATING (3)

**FUEL AUTO FEED FAULT**

**RH MAIN PUMP 1 FAULT**

UGB13131 - U7ST0M0 - UM28IZLEVEL0302

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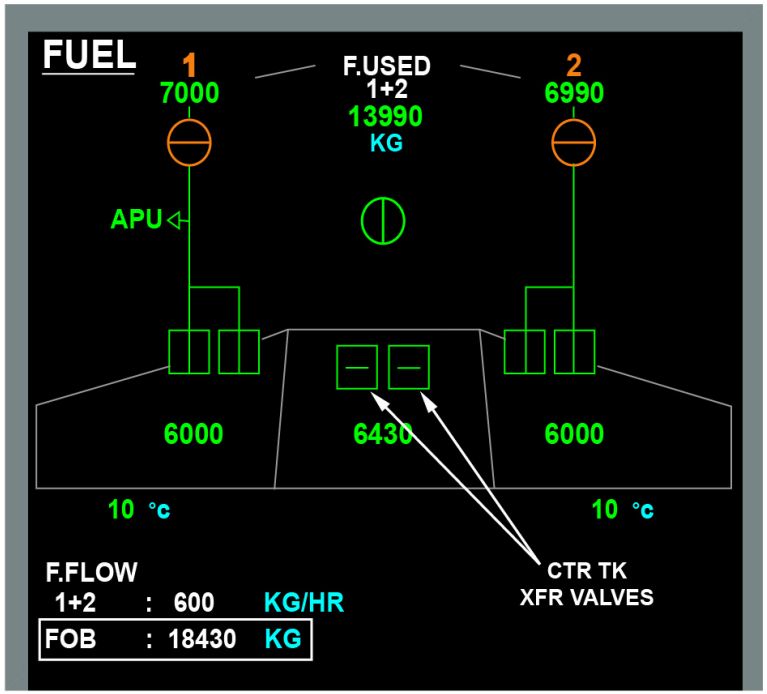
UGB13131 - U7ST0M0 - UM28IZLEVEL0302

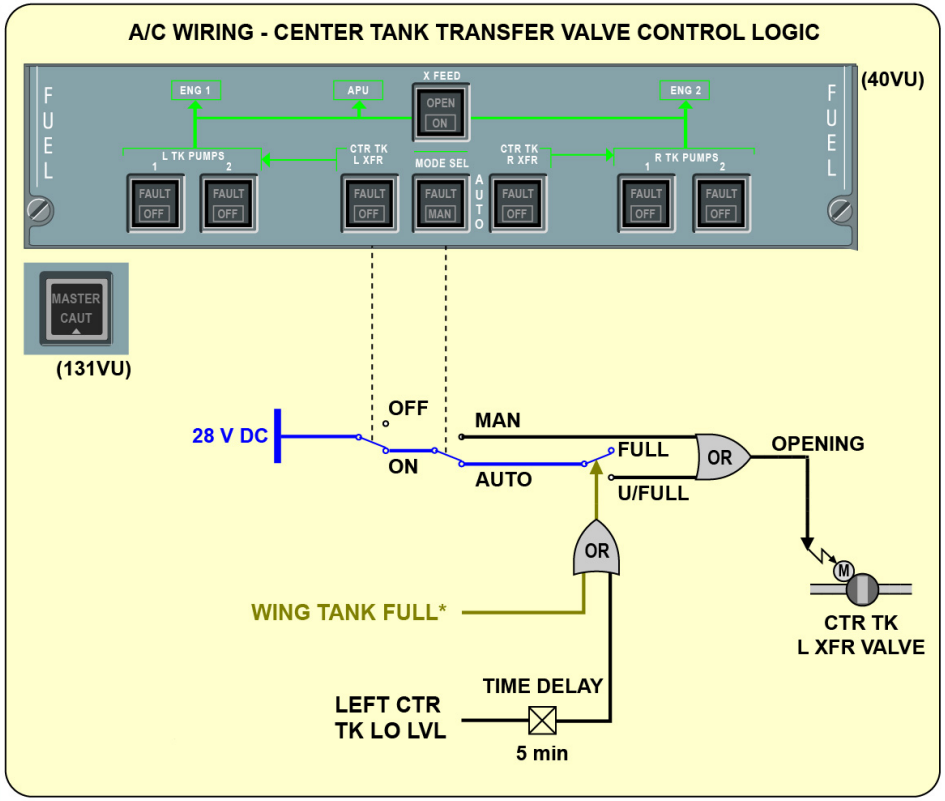
# FUEL FEED SYSTEM OPERATION (2)

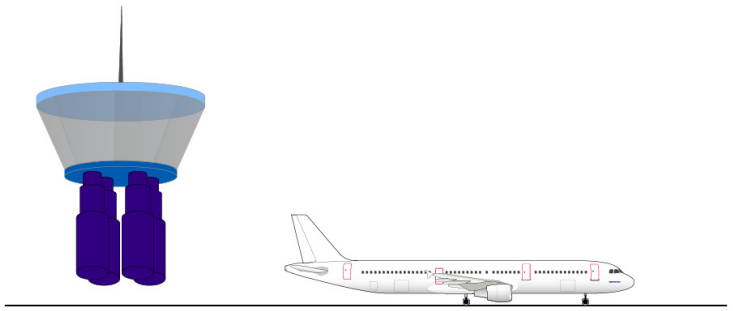
## AUTO MODE

The auto mode will cover the following steps:
- normal operation,
- transfer sequence,
- abnormal operation,
- failure conditions.

UGB13131 - U7ST0M0 - UM28P3000000003


FUEL
1
7000
F.USED
1+2
13990
KG
2
6990
APU
6000
6430
6000
10 °c
10 °c
F.FLOW
1+2 : 600 KG/HR
FOB : 18430 KG
CTR TK
XFR VALVES


A/C WIRING - CENTER TANK TRANSFER VALVE CONTROL LOGIC
(40VU)
FUEL
ENG 1
APU
X FEED
OPEN
ON
ENG 2
L TK PUMPS
CTR TK L XFR
MODE SEL
CTR TK R XFR
R TK PUMPS
FAULT
OFF
MAN
AUTO
MASTER CAUT
(131VU)
28 V DC
OFF
ON
MAN
AUTO
FULL
U/FULL
OR
OPENING
WING TANK FULL*
CTR TK
L XFR VALVE
LEFT CTR
TK LO LVL
TIME DELAY
5 min



AUTO MODE

# FUEL FEED SYSTEM OPERATION (2)

## AUTO MODE (continued)

### NORMAL OPERATION

A/C configuration before take-off is:
- full load of fuel,
- all 4 wing pumps ON,
- CenTeR TanK (CTR TK) transfer valve P/BSWs ON,
- MODE SELector P/BSW set to AUTO mode.

The center tank transfer valves indications are green when in CLOSED position on the ECAM.

NOTE: Left and right center tank transfer valves control is independent from each other.

At engine start, the fuel used indication is reset. The engine identification number changes color from amber to white at or above idle. Engines are supplied directly from the wing tanks.

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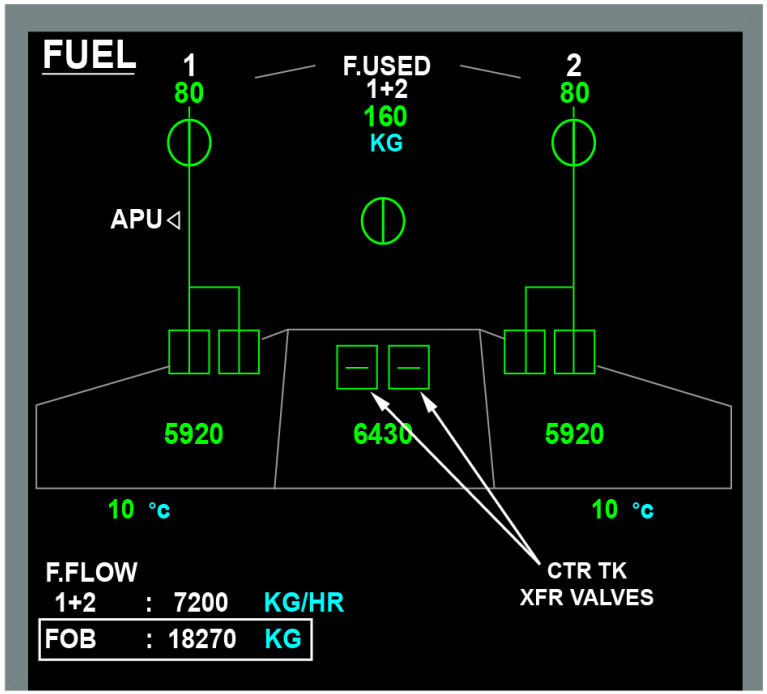
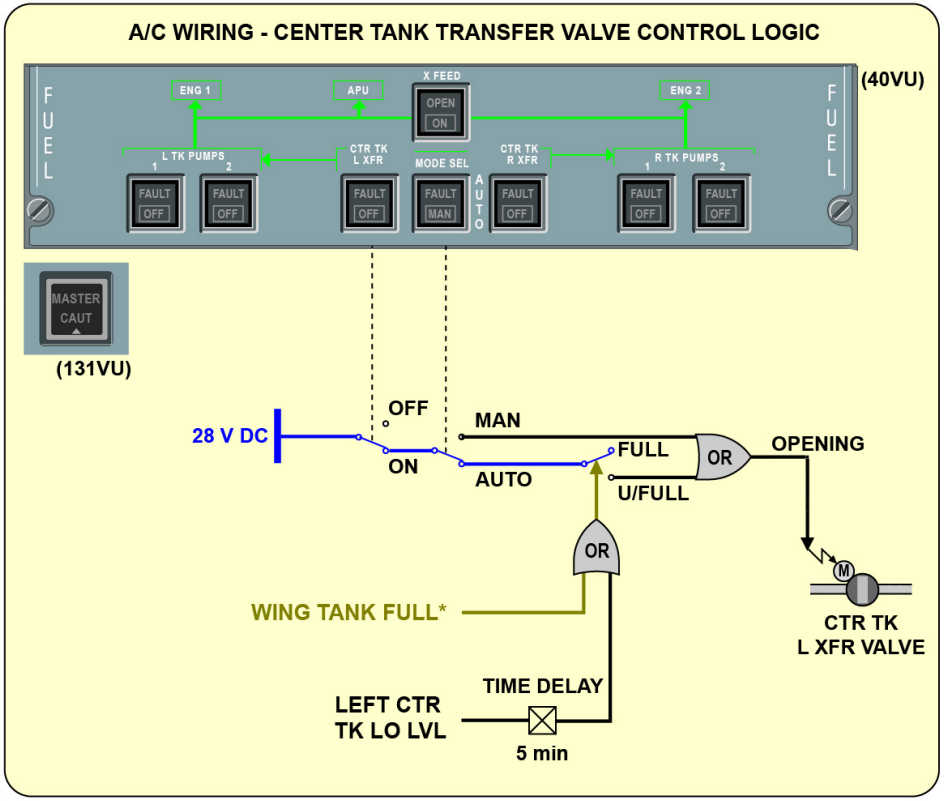
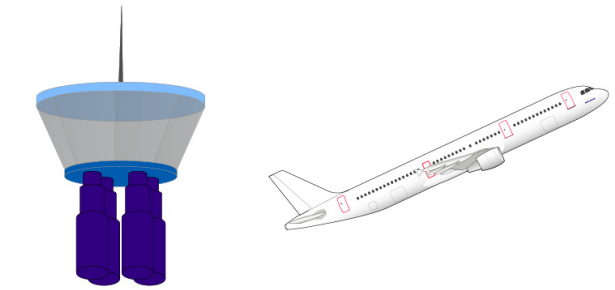


AUTO MODE - NORMAL OPERATION

# FUEL FEED SYSTEM OPERATION (2)

## AUTO MODE (continued)

### TRANSFER SEQUENCE

Each center tank transfer valve is controlled independently by its adjacent wing tank level sensors, i.e. full and underfull. When the fuel level in one wing has decreased by 200 kg, and has therefore reached the underfull level, the center tank transfer valve is controlled to open, and is displayed green, in line on the ECAM. Fuel is transferred from the center tank to the wing tank. When the full level is reached, the transfer valve is controlled to close, and is displayed green, cross line on the ECAM.

NOTE: This sequence can be initiated on ground depending upon the fuel level.

The transfer sequence is terminated; the center tank transfer valves close when the center tank low level sensors are dry and 5 minutes time delay has elapsed.

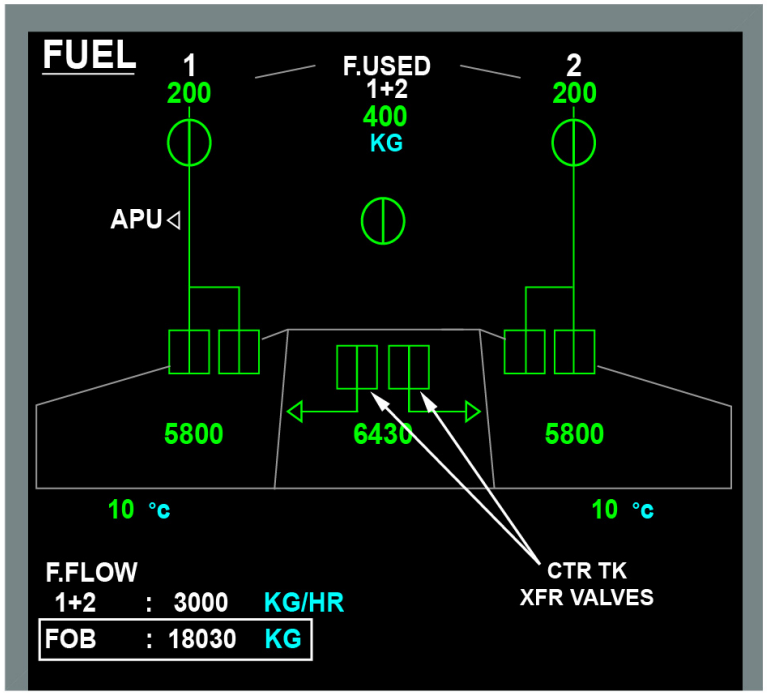
There are four low level sensors per wing tank:

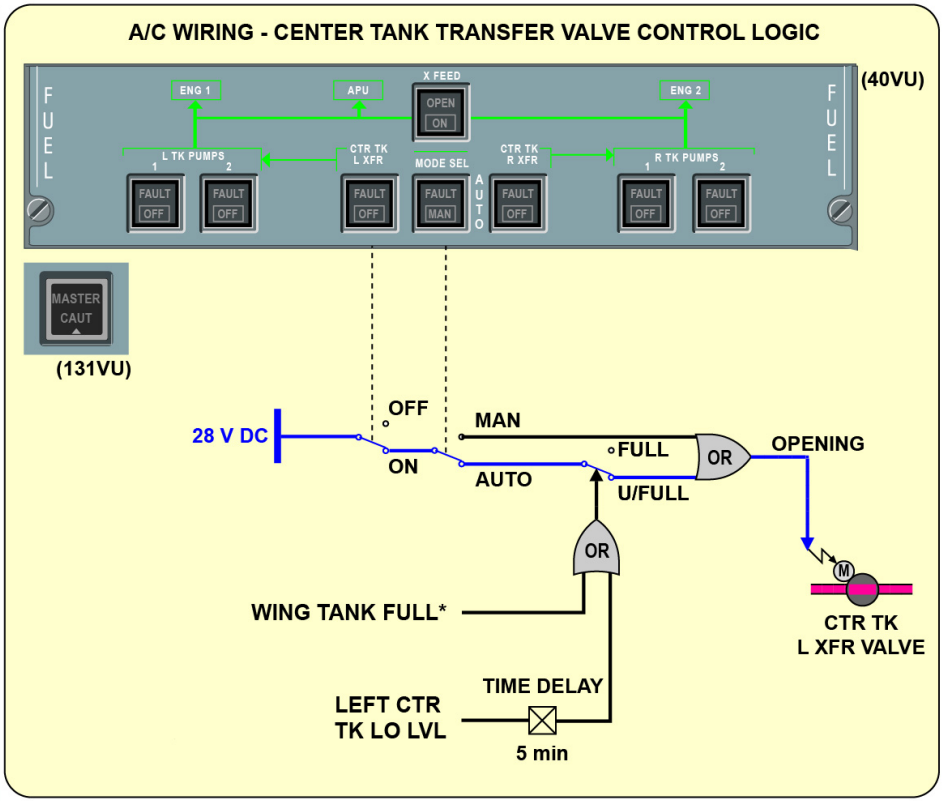
- two for 1500 kg level,
- two for 750 kg level.

When the fuel level in the wing tanks has decreased and two 1500 kg level sensors in a wing are continuously dry for 30 seconds, a MEMO message is shown.

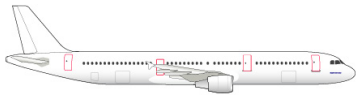
When the fuel level still decreases and two 750 kg low-level sensors in a wing are continuously dry for 30 seconds a low fuel level warning is triggered, i.e. single chime, MASTER CAUTion. When the engines are stopped, the engine identification numbers become amber.

UGB13131 - U7ST0M0 - UM28P3000000003

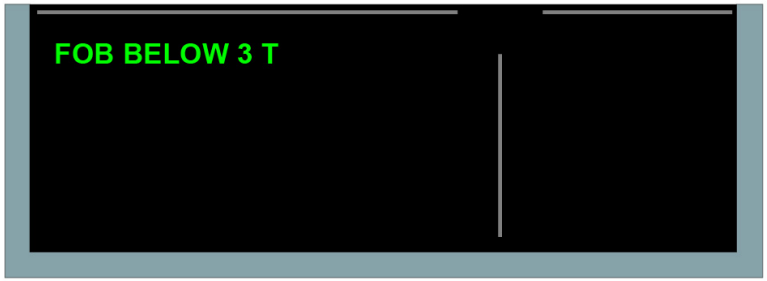


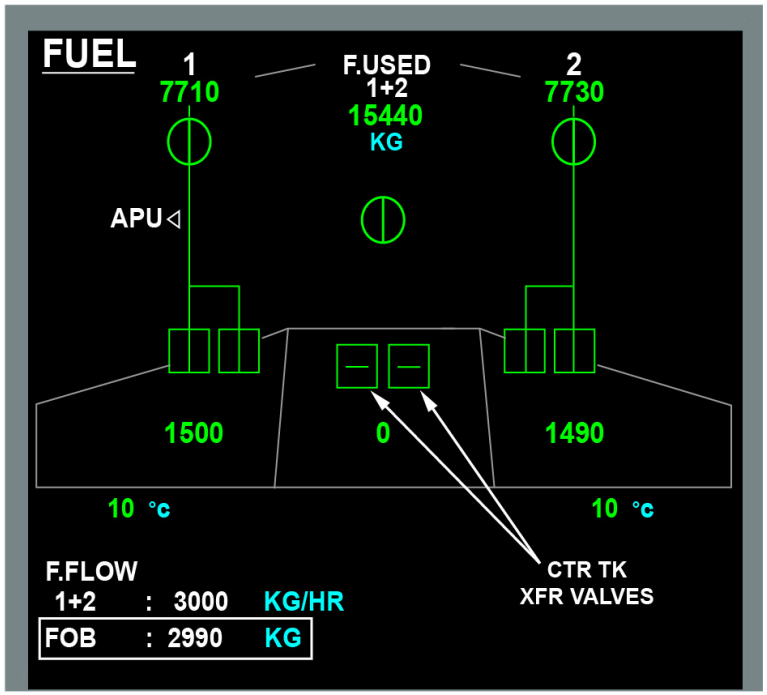



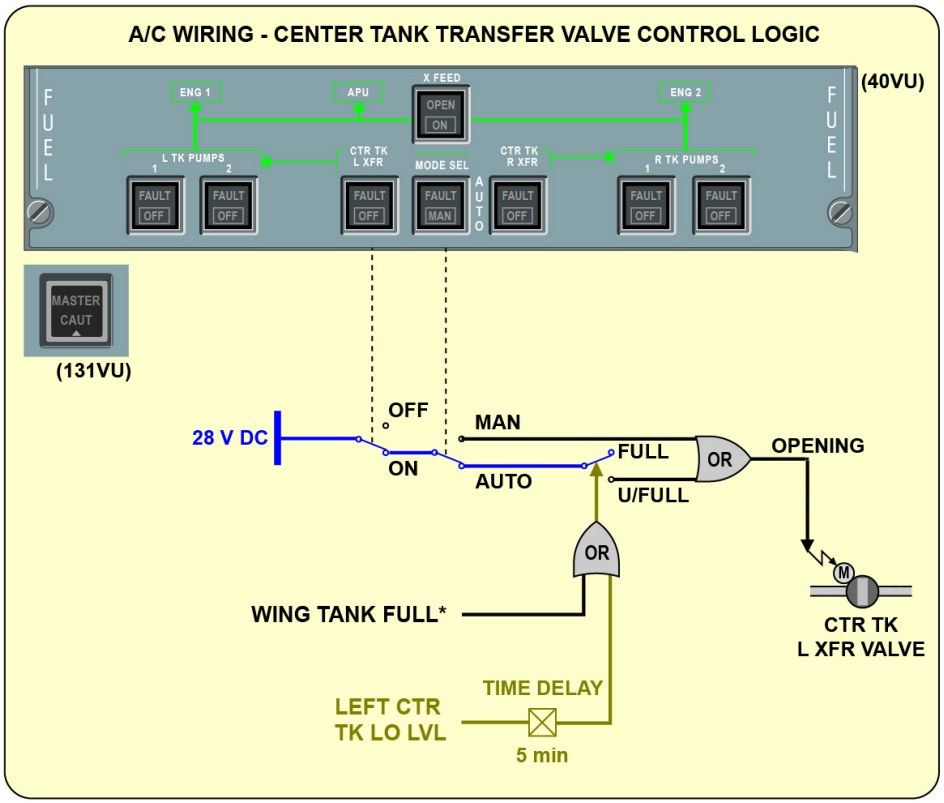

* CTR TK Transfer valve re-opens when the fuel level drop by fuel burn to the Under/Full sensors (200 KG below FULL LVL)

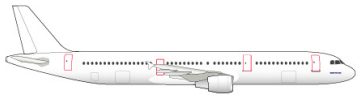


AUTO MODE - TRANSFER SEQUENCE

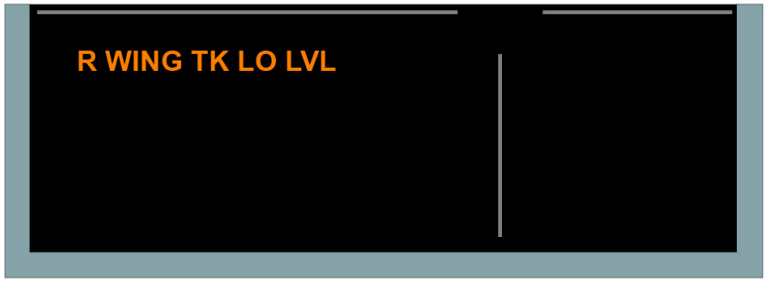


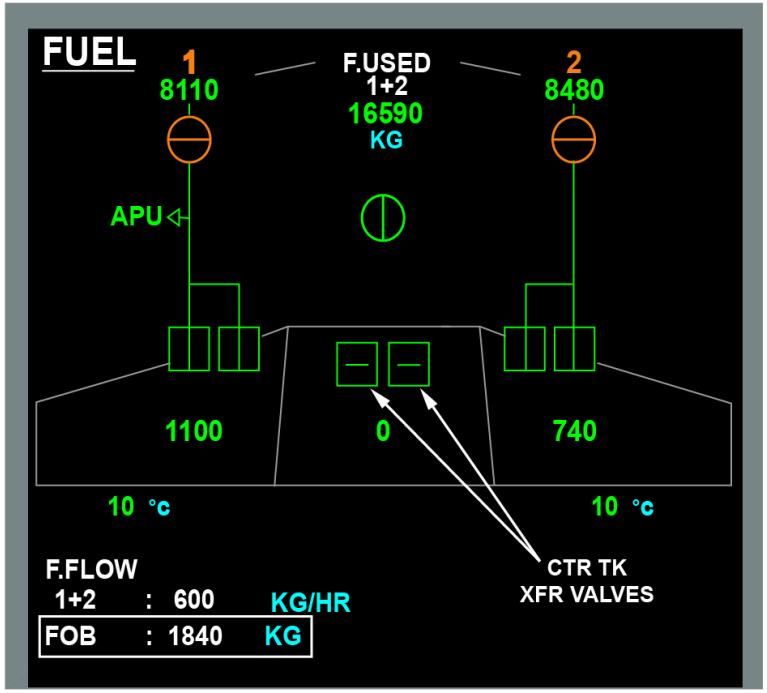



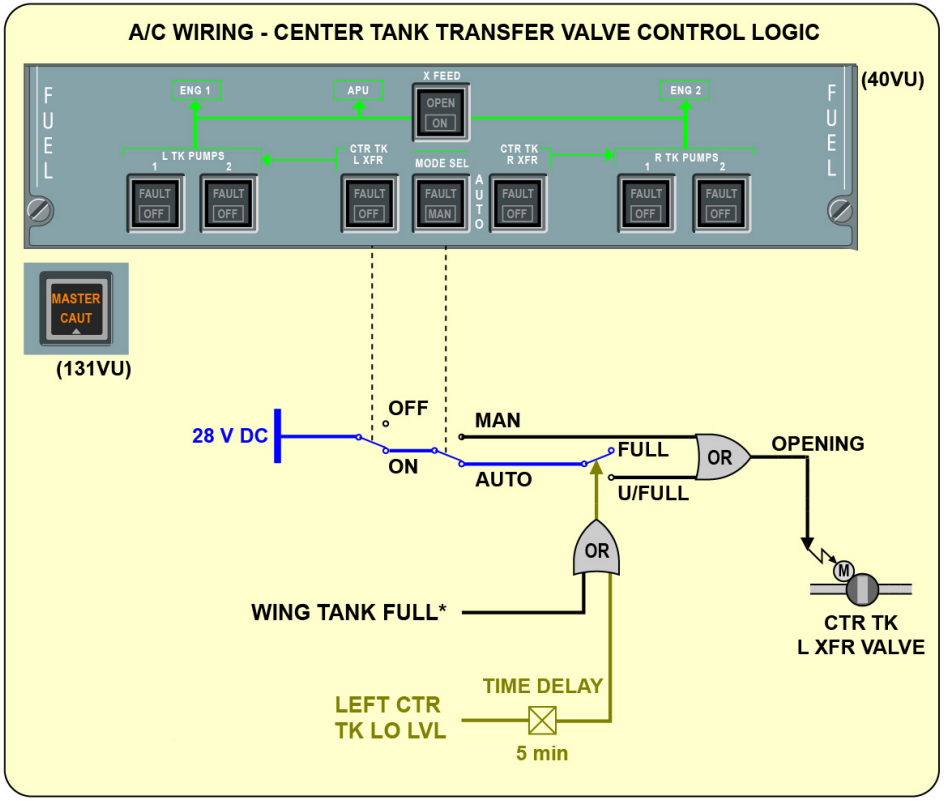



AUTO MODE - TRANSFER SEQUENCE



AUTO MODE - TRANSFER SEQUENCE

# FUEL FEED SYSTEM OPERATION (2)

## AUTO MODE (continued)

### ABNORMAL OPERATION

A/C in flight, in case of center tank transfer valves not controlled to open, the FAULT light on the MODE SEL P/BSW and the MASTER CAUT come on and the single chime sounds.

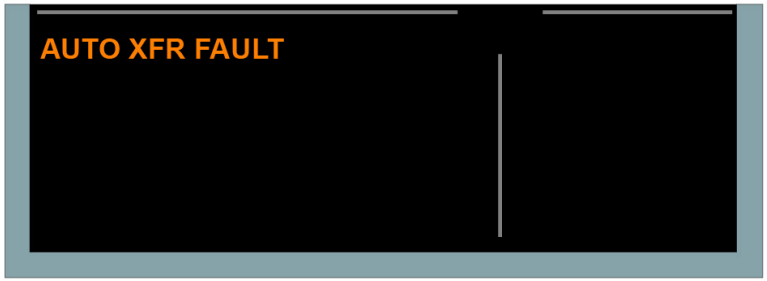
### FAILURE CONDITIONS

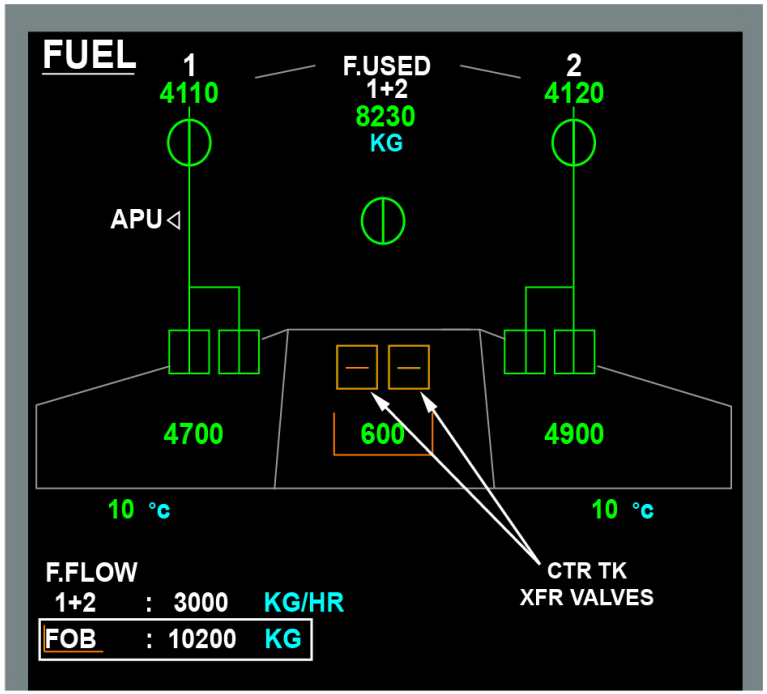
The failure conditions are:
- failure of the center tank transfer valves,
- with more than 250 kg fuel left in the center tank, with less than 5000 kg fuel in either wing tank.

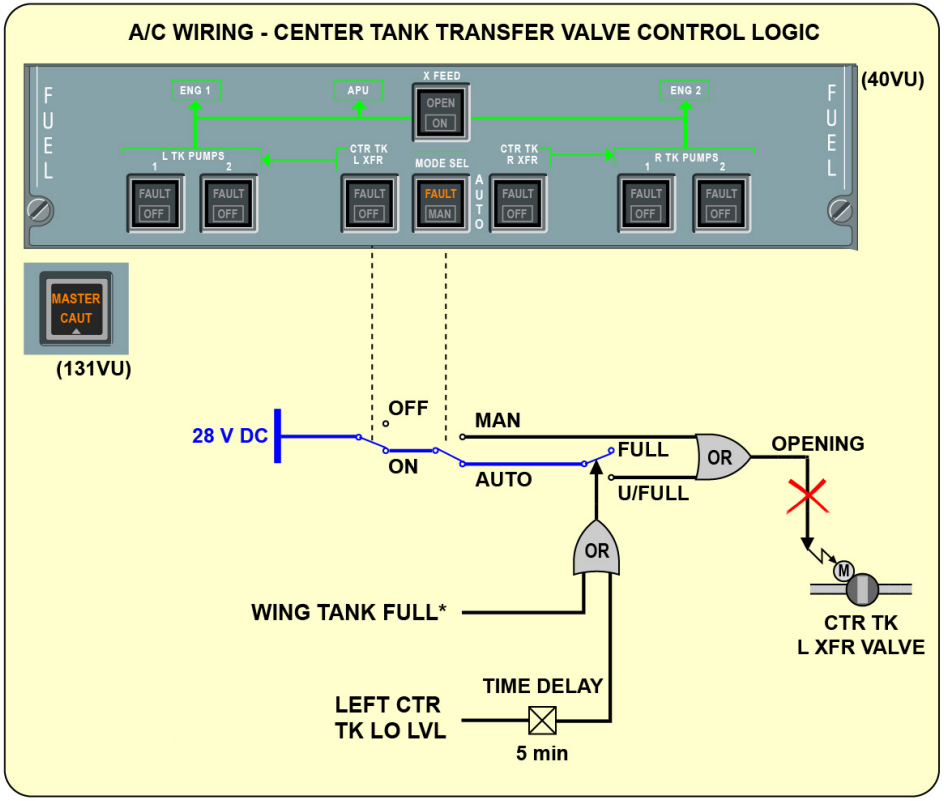
The FUEL page is automatically displayed and shows:
- center tank transfer valves amber crossed, center tank fuel quantity boxed amber, Fuel On Board (FOB) boxed amber,
- on the EWD an AUTO XFR FAULT message appears and, an amber half box is shown around the FOB indication.

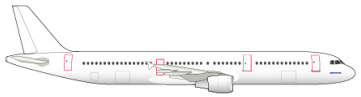
The crew must set the MODE SEL P/BSW to MAN mode.

UGB13131 - U7ST0M0 - UM28P3000000003





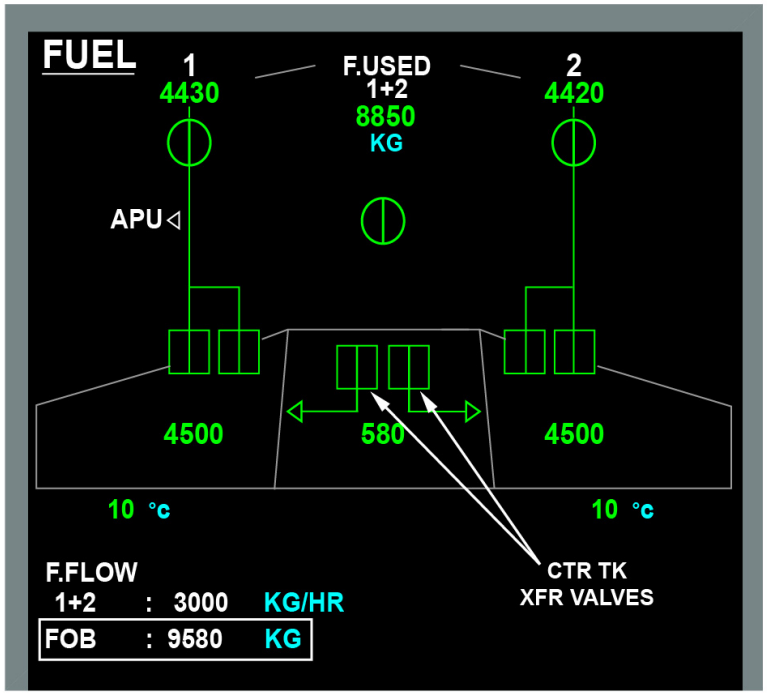
AUTO MODE - ABNORMAL OPERATION & FAILURE CONDITIONS

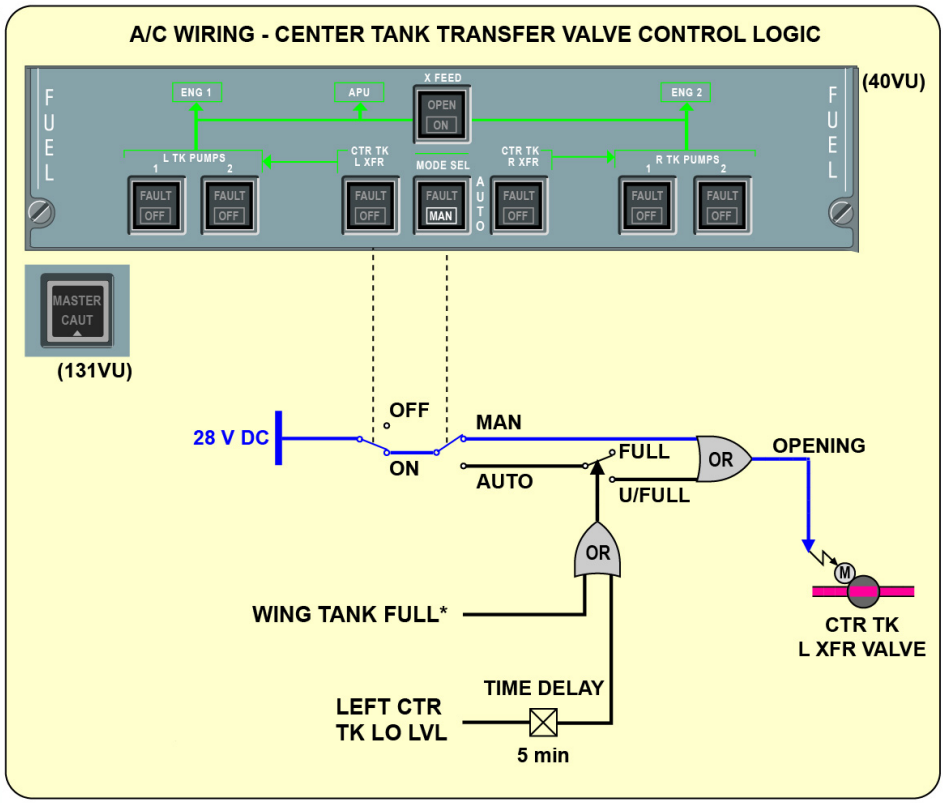
# FUEL FEED SYSTEM OPERATION (2)

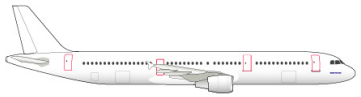
## MANUAL MODE

In manual mode, the center tank transfer valves are directly controlled from the respective CTR TK P/BSW. The FAULT light in the CTR TK left or right transfer P/BSW comes on amber, associated with an ECAM caution in case of related wing tank overflow. The related CTR TK L XFR or R XFR P/B switch must be set to OFF. After the FAULT light disappears the P/B will be selected and remains in that position until the FAULT light appears again. This procedure needs to be repeated as long as there is fuel in the Centre Tank. After the tank is empty both P/B switches are left in the OFF position with the valve symbols indicated in amber on the ECAM FUEL SD.

UGB13131 - U7ST0M0 - UM28P3000000003


FUEL
1
4430
F.USED
1+2
8850
KG
2
4420
APU
4500
580
4500
10 °c
10 °c
F.FLOW
1+2 : 3000 KG/HR
FOB : 9580 KG
CTR TK
XFR VALVES


A/C WIRING - CENTER TANK TRANSFER VALVE CONTROL LOGIC
(40VU)
FUEL
ENG 1
APU
X FEED
OPEN
ON
ENG 2
L TK PUMPS
CTR TK L XFR
MODE SEL
CTR TK R XFR
R TK PUMPS
FAULT
OFF
MAN
AUTO
MASTER CAUT
(131VU)
28 V DC
OFF
ON
MAN
AUTO
FULL
U/FULL
OR
OPENING
WING TANK FULL*
LEFT CTR TK LO LVL
TIME DELAY
5 min
CTR TK L XFR VALVE



MANUAL MODE

# FUEL QUANTITY INDICATING (3)

## GENERAL

The Fuel Quantity Indicating (FQI) is a computerized capacitance type system.
The system mainly provides:
- fuel mass/temperature measurement and display,
- control of automatic aircraft refueling,
- system integrity monitoring using BITE,
- ARINC 429 digital data for interface to other systems.

## FQIC

The Fuel Quantity Indication Computer (FQIC) does the fuel mass calculations and controls the whole system by means of various interfaces. The FQIC has two identical channels. Each channel calculates the tank quantities and monitors the status of the other channel. The healthiest channel is in control. If one channel fails, the system operates normally, but the ECAM will indicate a failure warning on the upper Display Unit (DU) as well as the Centralized Fault Display System (CFDS) report will indicate the failure.

## PROBES

A set of capacitance probes in each tank sends a signal to the computer in relation to the fuel level in the tank. A single probe failure doesn't affect the system indication. In each wing tank, a diode is attached to fuel probe No. 2 that gives the fuel temperature to the FQIC for indication on the ECAM system display.

## DUALCOMP

The dualcomp is installed in the fuel tank and operates as a variable capacitor. The capacitance value is a result of the density of the fuel between the plates. The fuel density changes with temperature and type of fuel.

## ULTRACOMP

The ultracomp has three functions:
- variable capacitors value, which has the same function as the dualcomp,
- a velocimeter measurement function,
- a temperature sensing function.

The FQIC uses all this information together with the dual comp to calculate the density of the fuel.

## FLSCU

The Fuel Level Sensing Control Units (FLSCUs) are mainly used:
- to shut the related refuel valve when the high level is reached in each tank,
- to initiate the BITE test of the high level sensors and their related circuits, by using the test switch on the refuel/defuel control panel.

High level sensors in each tank send a signal to the FQIC, via the FLSCU. The test is initiated via the FQIC and the FLSCU. Sensor and system status are sent from the FQIC to the CFDS.

## REFUEL/DEFUEL CONTROL PANEL

The FQIC provides automatic shut-off at a preselected refuel quantity. When the MODE SELECT switch on the refuel/defuel control panel has been set to the REFUEL position, the FQIC first makes sure that it is physically possible to take the preselected fuel quantity into the aircraft. Throughout the automatic refuel operation the FQIC monitors the density of fuel in each tank and the distribution of the load.

## MTI

A Multi Tank Indicator (MTI) displays the fuel quantity in each tank.

### FWC

The FWC operates the audible warning and causes the MASTER CAUT light to come on.

### PRESELECTOR

The pre-selector shows the pre-selected and actual total fuel quantities, as monitored by the computer.

### LGCIU 1

The FQIC receives the left and right L/G compressed information from Landing Gear Control and Interface Unit (LGCIU) 1.

### L/G CONTROL LEVER

The FQIC receives ground information from the L/G when selected DOWN with the aircraft on jacks. This signal is used to give electrical supply to the FQIC in this specific configuration.

### ADIRS

Acceleration data is received from the Air Data/Inertial Reference System (ADIRS) during flight and is used as an alternate source of attitude. Normally, effects of attitude, changes in acceleration, effective pitch and roll angles, are calculated from the height of fuel at each probe and the knowledge of the tank geometry stored in the computer memory.

### CFDS

ARINC 429 output links transmit BITE information from the computer to the CFDS. The CFDS monitors fault conditions and BITE.

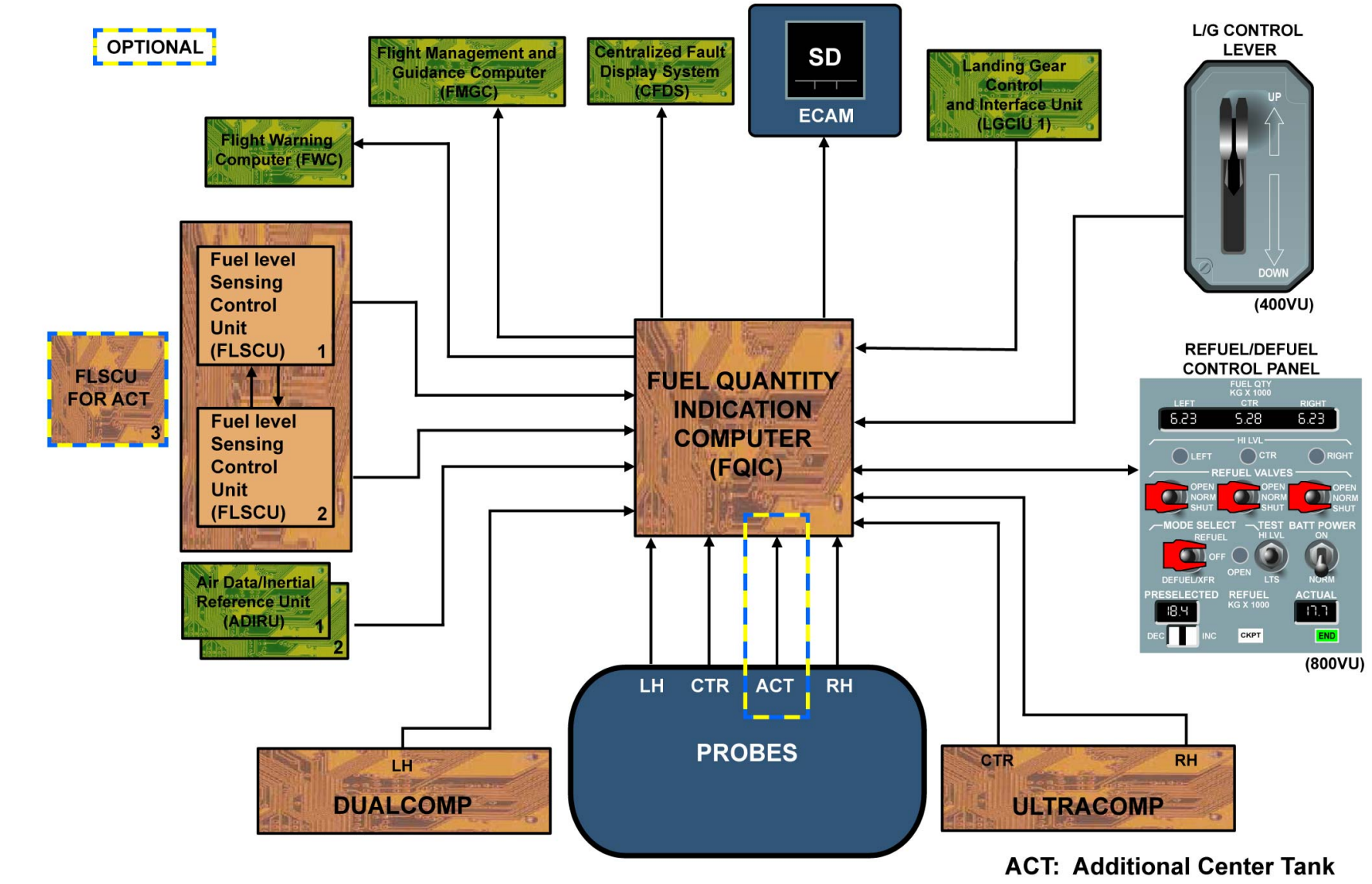
### FMGC

Fuel parameters are sent to the Flight Management and Guidance Computers (FMGCs), for navigation computations.

### ECAM

Total and individual tank fuel mass information is sent to the ECAM for display.

UGB13131 - U7ST0M0 - UM28D600000002




GENERAL ... ECAM

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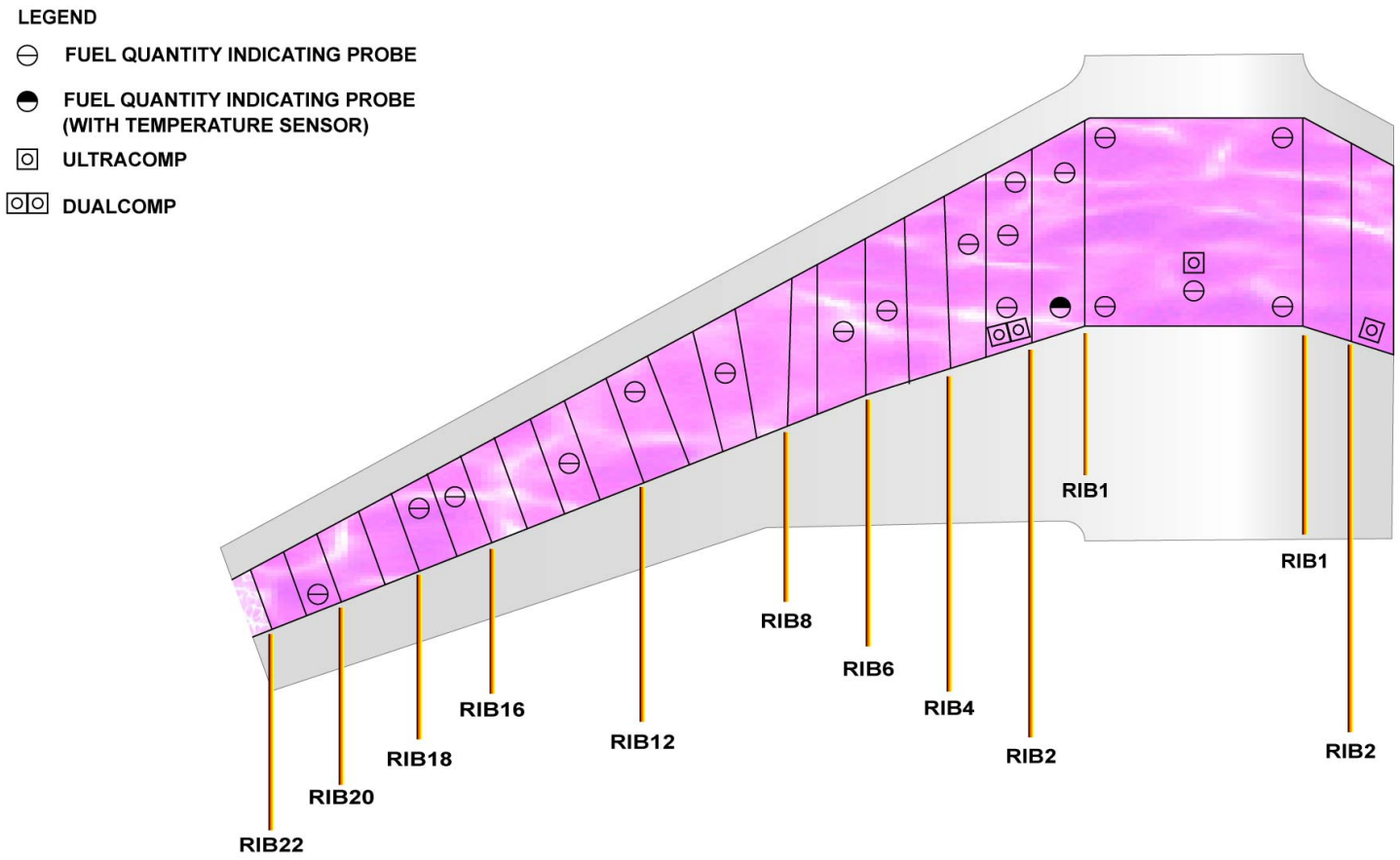
UGB13131 - U7ST0M0 - UM28D600000002

# FUEL QUANTITY INDICATING (3)

## LOCATION

There are 5 probes in the center tank and 14 per wing tank. 2 probes are located in the optional additional center tank.

UGB13131 - U7ST0M0 - UM28D600000002


LEGEND
FUEL QUANTITY INDICATING PROBE
FUEL QUANTITY INDICATING PROBE (WITH TEMPERATURE SENSOR)
ULTRACOMP
DUALCOMP
RIB1
RIB1
RIB8
RIB6
RIB4
RIB2
RIB2
RIB16
RIB12
RIB18
RIB20
RIB22

LOCATION

# FUEL LEVEL SENSING (3)

## B2 SCOPE

CAUTION: MODULE TAGGED B2 SCOPE.
BE AWARE THAT ONLY AVIONICS/ELECTRICAL TOPICS SHOULD BE LEARNED FOR A T2 COURSE.

## GENERAL

The aircraft has two multi-channel Fuel Level Sensing Control Units (FLSCUs) and a third one, if the Additional Center Tank (ACT) is installed. They supply high fuel level sensing, low fuel level sensing, full fuel level sensing, underfull fuel level sensing, and overflow level and temperature sensing. Fuel level and temperature sensors feed signals to the multi-channel amplifiers. The FLSCUs detect and amplify the signals and trigger switching functions in the appropriate circuits.

## HIGH LEVEL

The high level sensors, when immersed in fuel, command the closure of the associated tank refuel valve when the MODE SELECT switch is set to the REFUEL position.
Wet high-level sensors cause the associated:
- tank refuel valves to shut,
- blue HIGH LEVEL lights to come on, on the refuel/defuel control panel.

The wet center tank high-level sensor causes fuel transfer from the optional ACT to the center tank to stop.

## LOW LEVEL

The center tank low-level sensors control the automatic transfer of fuel from the center tank to the wing tanks. When sensors become dry for 5 minutes, the FLSCUs send a close signal to the related control valve.
4 low-level sensors are used in each wing tank:
- 2 in each wing for 1500 kg (3307 lbs) fuel level, in case of exposure to air for more than 30 s: low fuel level advisory on the memo page,
- 2 in each wing for 750 kg (1653 lbs) fuel level, in case of exposure to air for more than 30 s: low fuel level warning on the ECAM.

Exposure of the optional ACT low-level sensors causes the fuel FWD transfer to stop.

## FULL LEVEL

When the full level is reached in one wing tank, the center transfer valve closes to stop fuel transfer operation from the center tank to the wing tank until the fuel level in the wing tank reaches the underfull level.

## UNDERFULL LEVEL

When the fuel level in the wing tanks drop to the underfull sensors, the center tank transfer valves are controlled to open for a fuel transfer operation, provided there is fuel in the center tank. The difference between full and underfull level sensors is equal to a fuel quantity of 200 kg (440 lbs).

## OVERFLOW LEVEL

When full level is reached in the wing tank and overflows into the vent surge tank, the overflow sensor sends a signal to the Engine Interface Unit (EIU) to close the Fuel Return Valve (FRV).

## TEMPERATURE SENSOR

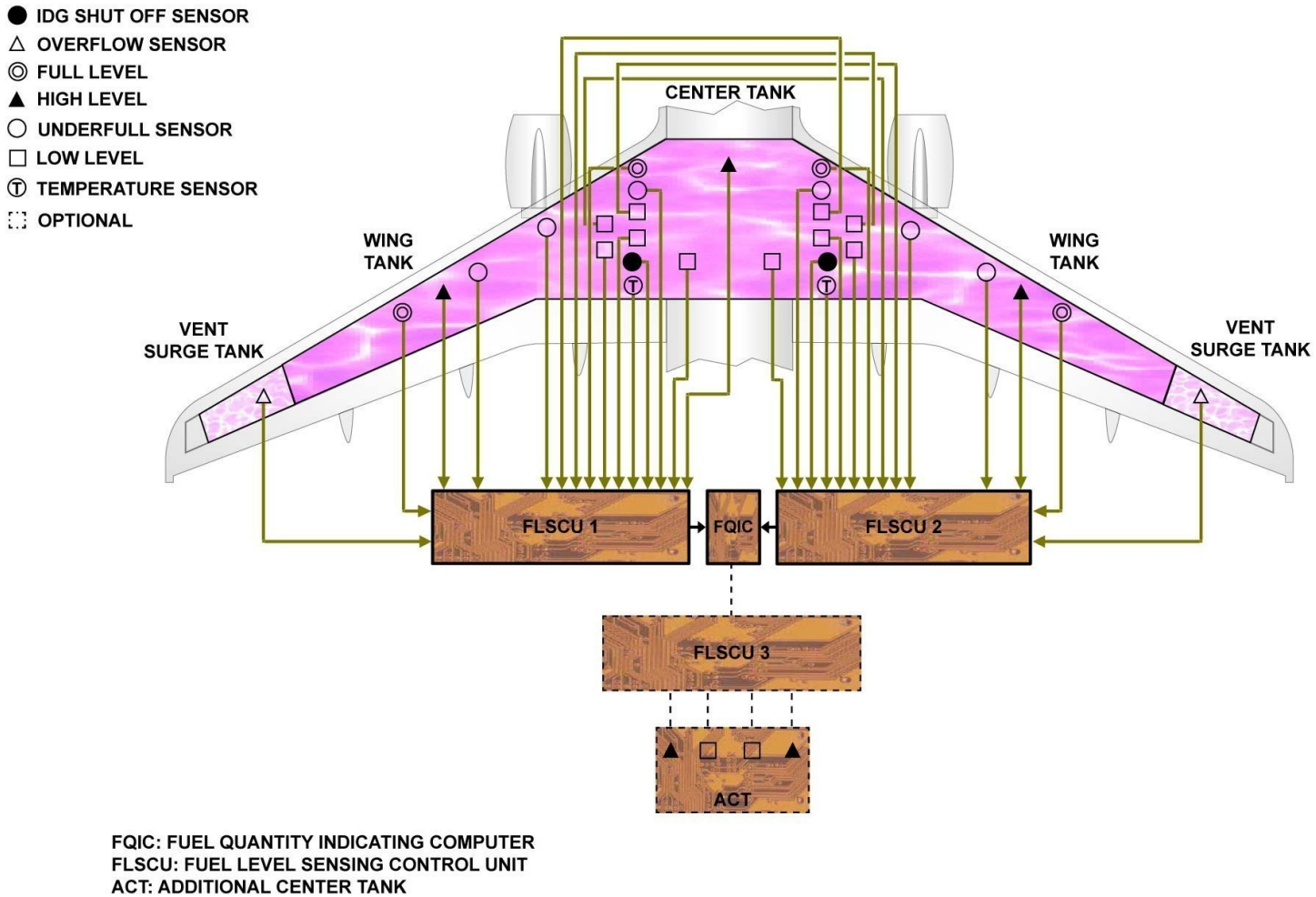
The temperature sensor commands the closure of the FRV, when the temperature of the fuel in the wing exceeds the limits i.e. 52.5°C (126.5°F).

UGB13131 - U7ST0M0 - UM28P600000002

## IDG SHUT-OFF SENSOR

The FLSCUs signal the Full Authority Digital Engine Control (FADEC) to close the FRV. If the fuel level is below 280 kg (616 lbs), the IDG shut-off sensor stops the IDG cooling.

UGB13131 - U7ST0M0 - UM28P600000002




B2 SCOPE ... IDG SHUT-OFF SENSOR

UGB13131 - U7ST0M0 - UM28P600000002

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UGB13131 - U7ST0M0 - UM28P600000002

# A321 FUEL VENT SYSTEM D/O (3)

## GENERAL

The fuel tank venting system prevents overstressing of tanks.

### VENT SURGE TANK

Each vent surge tank vents to the atmosphere through a NACA type intake connected to a vent duct. A vent protector and a flame arrestor are in the vent duct. The function of the vent protector is to prevent clogging of the vent duct by ice formation. The flame arrestor decreases the risk of a ground fire which could cause ignition of the fuel tanks. Fuel spilled through the vent pipes into the surge tank is put back into the outer cell by a scavenge jet pump that uses motive power from the wing fuel pumps.

### WING TANK VENTING SYSTEM

Each wing tank vents to the related vent surge tank. The ducts are sufficiently large to make sure that if there is a failure of the pressure refueling shut-off system, excess fuel will be discharged overboard through the NACA intake. A rubber check valve installed in the vent line lets all fuel that goes into the vent lines drain back to the related tank.

### CENTER TANK VENTING SYSTEM

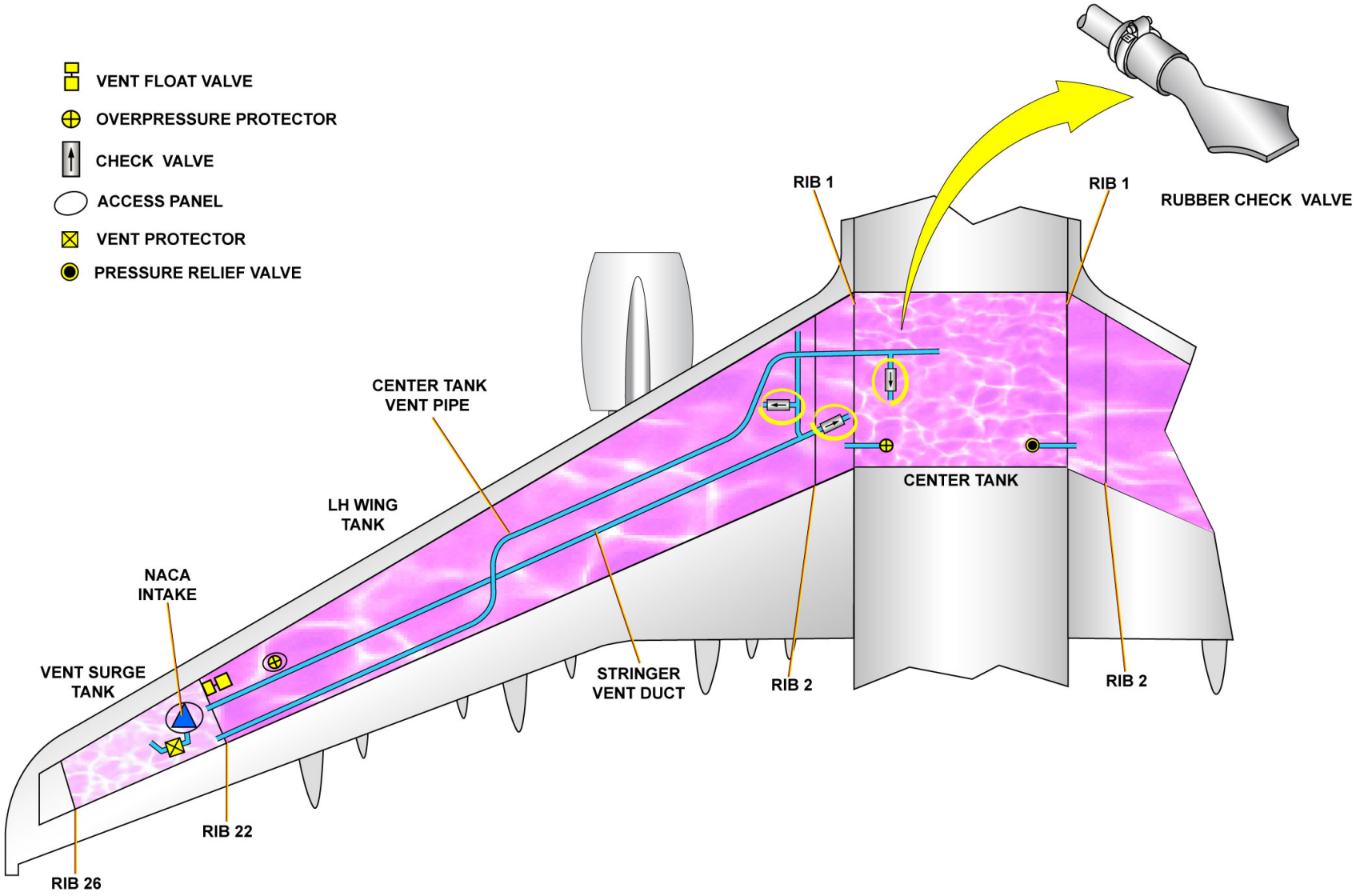
The center tank vents into the LH vent surge tank. The center tank vent line is a standard open line that includes a check valve and is sufficiently large for an airflow. If the center tank is filled with too much fuel, most of the fuel flows to the right wing tank through the relief valve.

### OVERPRESSURE PROTECTION

Overpressure protectors are installed in the system to release pressure in the tanks that can be caused by a vent blockage or a pressure refueling gallery failure. Too much pressure in the outer cell causes fuel to be released into the inner cell through an overpressure protector installed between rib 25 and rib 24. Too much pressure in the inner cell or in the vent surge tank causes fuel to be released overboard through an overpressure protector installed on a tank access panel. The center tank overpressure protector releases fuel into the left wing tank.

### VENT FLOAT VALVE

This valve will let the air flow between the wing tank and the related surge tank to keep an equal pressure. The float valve will close when the wing tank is full to prevent fuel spills into the surge tank.

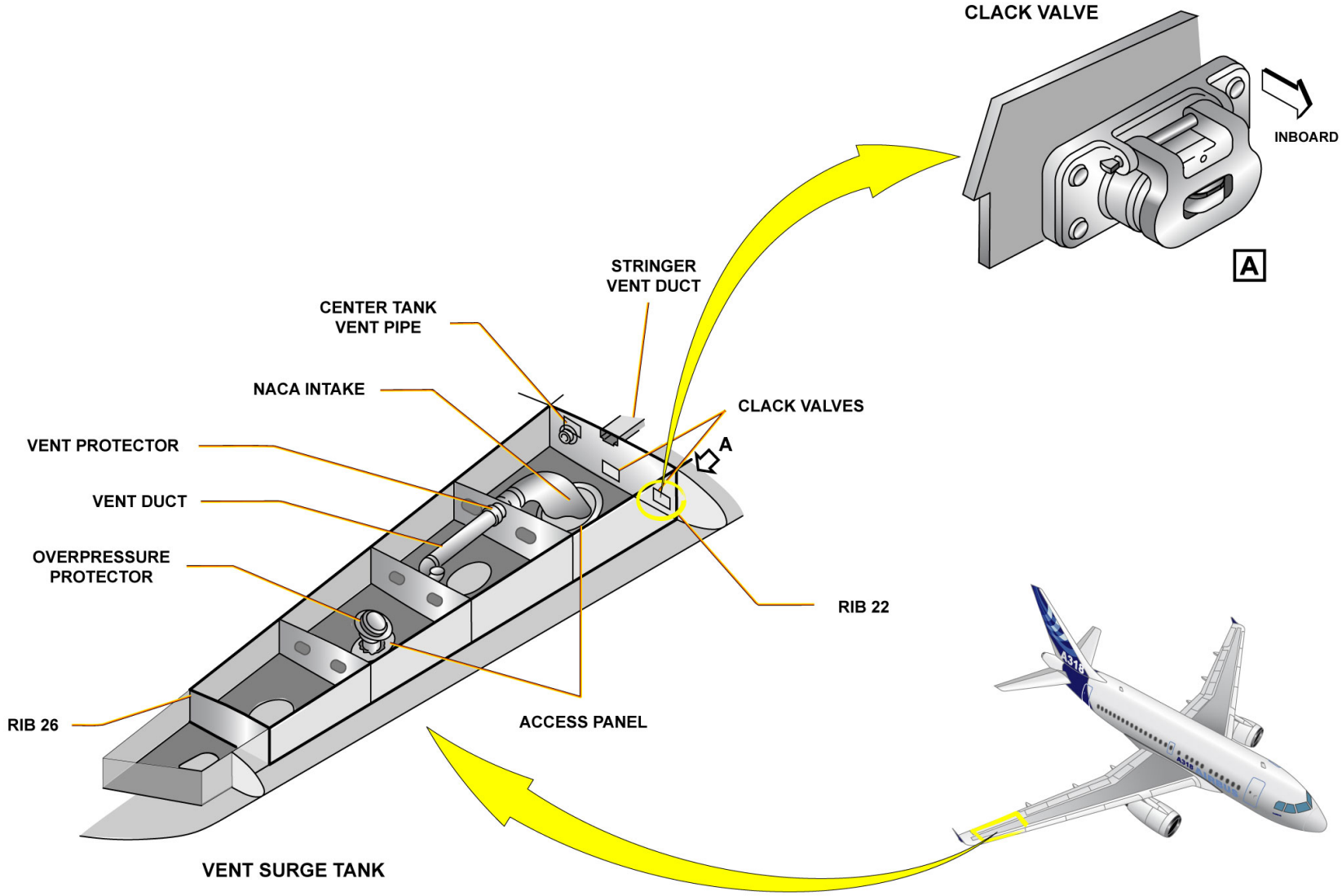



GENERAL - VENT SURGE TANK ... VENT FLOAT VALVE

# A321 FUEL VENT SYSTEM D/O (3)

## VENT SURGE TANK LAYOUT

A vent surge tank is installed in the LH and RH wings between rib 22 and rib 26. The vent surge tank is open to the external air through a stack pipe which is connected to a NACA duct. The NACA duct is on an access panel at the bottom of the vent surge tank.
The vent surge tank lets the air flow through it in each direction. The vent surge tanks have a capacity of 190 liters (50 US gal).



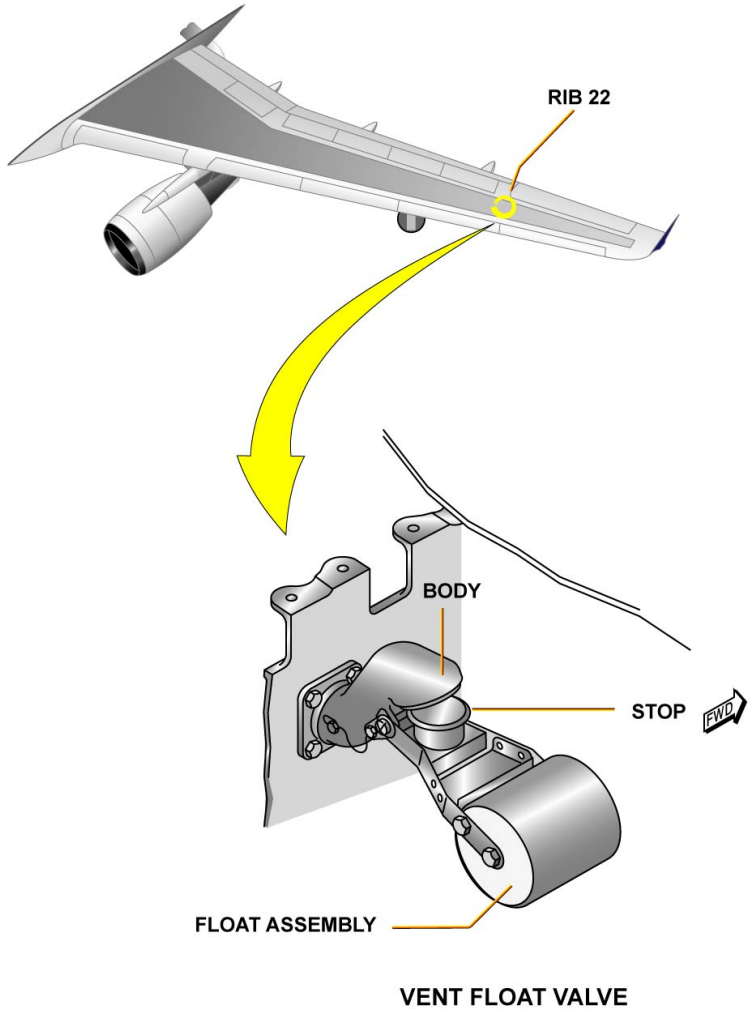

VENT SURGE TANK LAYOUT

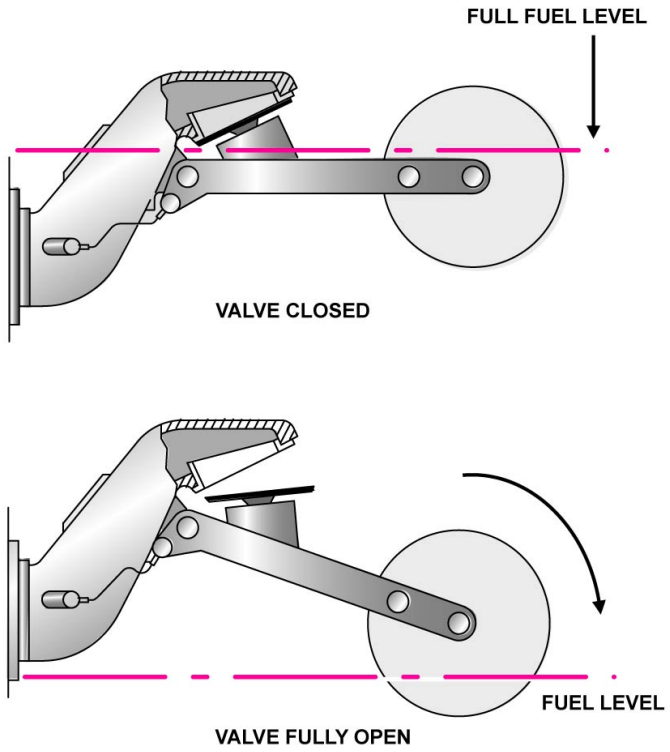
# A321 FUEL VENT SYSTEM D/O (3)

## VENT FLOAT VALVE LAYOUT

A vent float valve is installed at RIB 22 in each wing tank.
The vent float valve includes:
- A body,
- A stop,
- A float assembly.

UGB13131 - U7ST0M0 - UM28DA000000001




VENT FLOAT VALVE LAYOUT

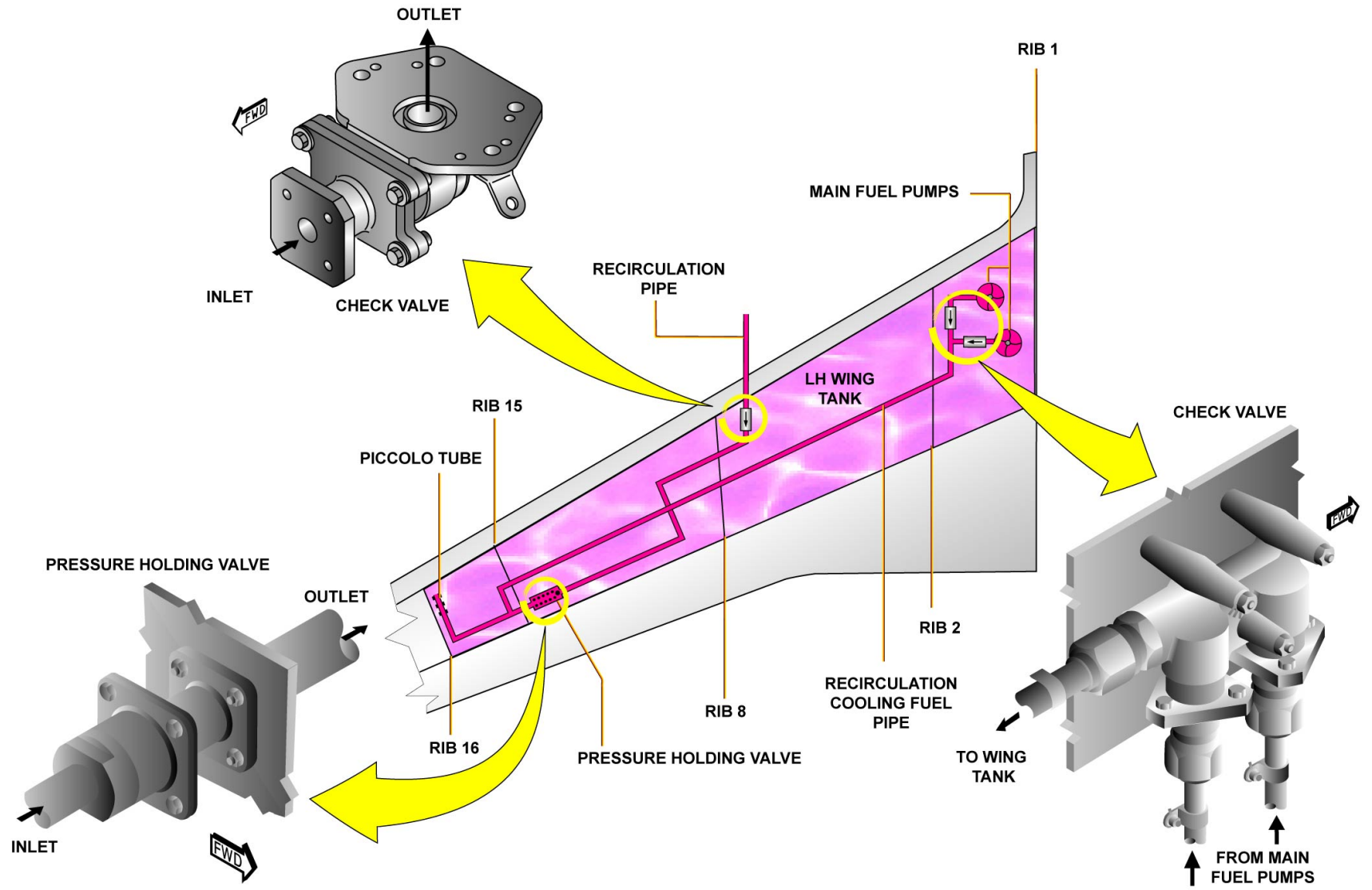
# A321 FUEL RECIRCULATION SYSTEM D/O (3)

## GENERAL

The recirculation system has for each engine:
- A recirculation pipe
- A cooling fuel pipe
- A piccolo tube
- A recirculation pressure-holding valve
- Three recirculation check valves

The recirculation pipe connects to the Fuel Return Valve (FRV) and the inboard face of rib 16 in the wing tank. Two holes at the end of the recirculation pipe let the fuel go into the wing tank.
The piccolo tube is attached to the end of the recirculation pipe. The piccolo tube has six holes that let the fuel go into the wing tank.
The cooling fuel pipe is attached to the recirculation pipe on the outboard face of rib 15. The main fuel pumps move the fuel through the cooling fuel pipe.

UGB13131 - U7ST0M0 - UM28DB000000001


OUTLET
FWD
INLET
CHECK VALVE
RIB 1
MAIN FUEL PUMPS
RECIRCULATION PIPE
LH WING TANK
RIB 15
PICCOLO TUBE
CHECK VALVE
PRESSURE HOLDING VALVE
OUTLET
RIB 2
RIB 8
RECIRCULATION COOLING FUEL PIPE
RIB 16
PRESSURE HOLDING VALVE
TO WING TANK
INLET
FWD
FROM MAIN FUEL PUMPS

GENERAL

# ACT SYSTEM PRESENTATION (2)

## GENERAL

The installation of 6 Additional Center Tanks (ACTs) in the aft cargo compartment increases the A319 CJ fuel capacity. The fuel capacity is approximately:
- 2497 kg (5504lb) for ACT 1, 2 or 6,
- 1749 kg (3856 lb) for ACT 3 or 4,
- 2437 kg (5373 lb) for ACT 5.

The fuel management system has also:
- two Fuel Level Sensing Control Units (FLSCUs),
- one Auxiliary Level Sensor Control Unit (ALSCU).

## FEED CONCEPT

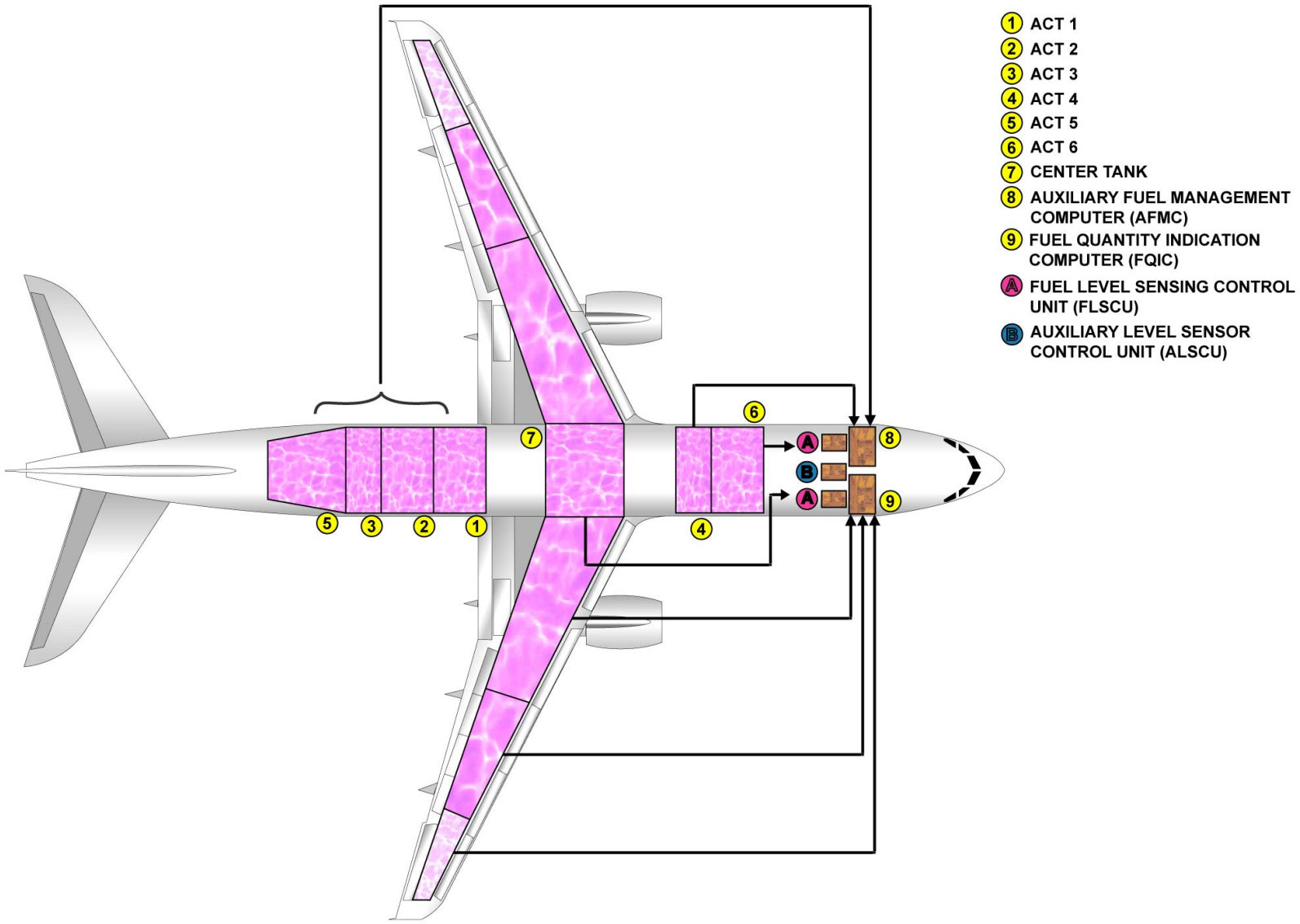
Fuel is automatically transferred from the ACT to the center tank when the fuel level of the center tank decreases.

## MANAGEMENT

The different functions of the system are:
- fuel level sensing,
- fuel transfer from ACT to center tank,
- refuel/defuel control and monitoring,
- indications,
- warnings,
- test.

The Auxiliary Fuel Management Computer (AFMC) manages refuel operations of the ACT and the Fuel Quantity Indication Computer (FQIC) manages wing and center tanks refuel operations. FLSCU's 1 and 2 for LH, and RH are used for wing and center tank fuel level sensing. ALSCU is used for ACT fuel level sensing.

UGB13131 - U7ST0M0 - UM28P8000000002


1 ACT 1
2 ACT 2
3 ACT 3
4 ACT 4
5 ACT 5
6 ACT 6
7 CENTER TANK
8 AUXILIARY FUEL MANAGEMENT COMPUTER (AFMC)
9 FUEL QUANTITY INDICATION COMPUTER (FQIC)
A FUEL LEVEL SENSING CONTROL UNIT (FLSCU)
B AUXILIARY LEVEL SENSOR CONTROL UNIT (ALSCU)

GENERAL ... MANAGEMENT

# ACT INSTALLATION PRESENTATION (2)

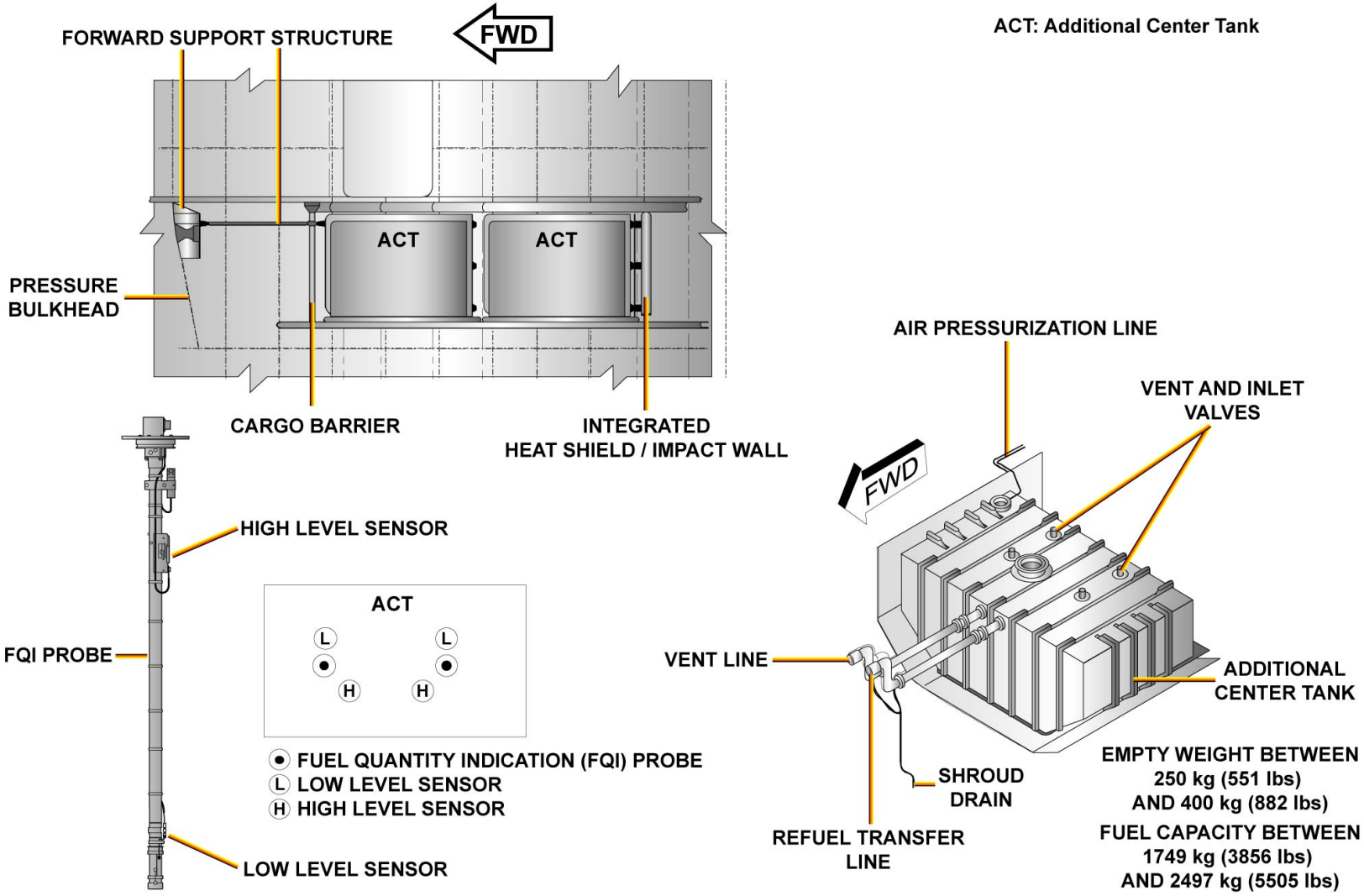
## GENERAL

The Additional Center Tanks (ACTs) are installed in the aft and FWD cargo compartments.

## INSTALLATION

When loaded into the aft / FWD cargo hold through the aft / FWD cargo door, the ACT must connect to the systems that follow:
- refuel/defuel pipe,
- vent pipe,
- drain system pipes,
- air pressurization line,
- Fuel Quantity Indication (FQI) and level sensing systems,
- vent and inlet valves power supplies,
- impact/heat shield wall.

UGB13131 - U7ST0M0 - UM28P900000002




GENERAL & INSTALLATION

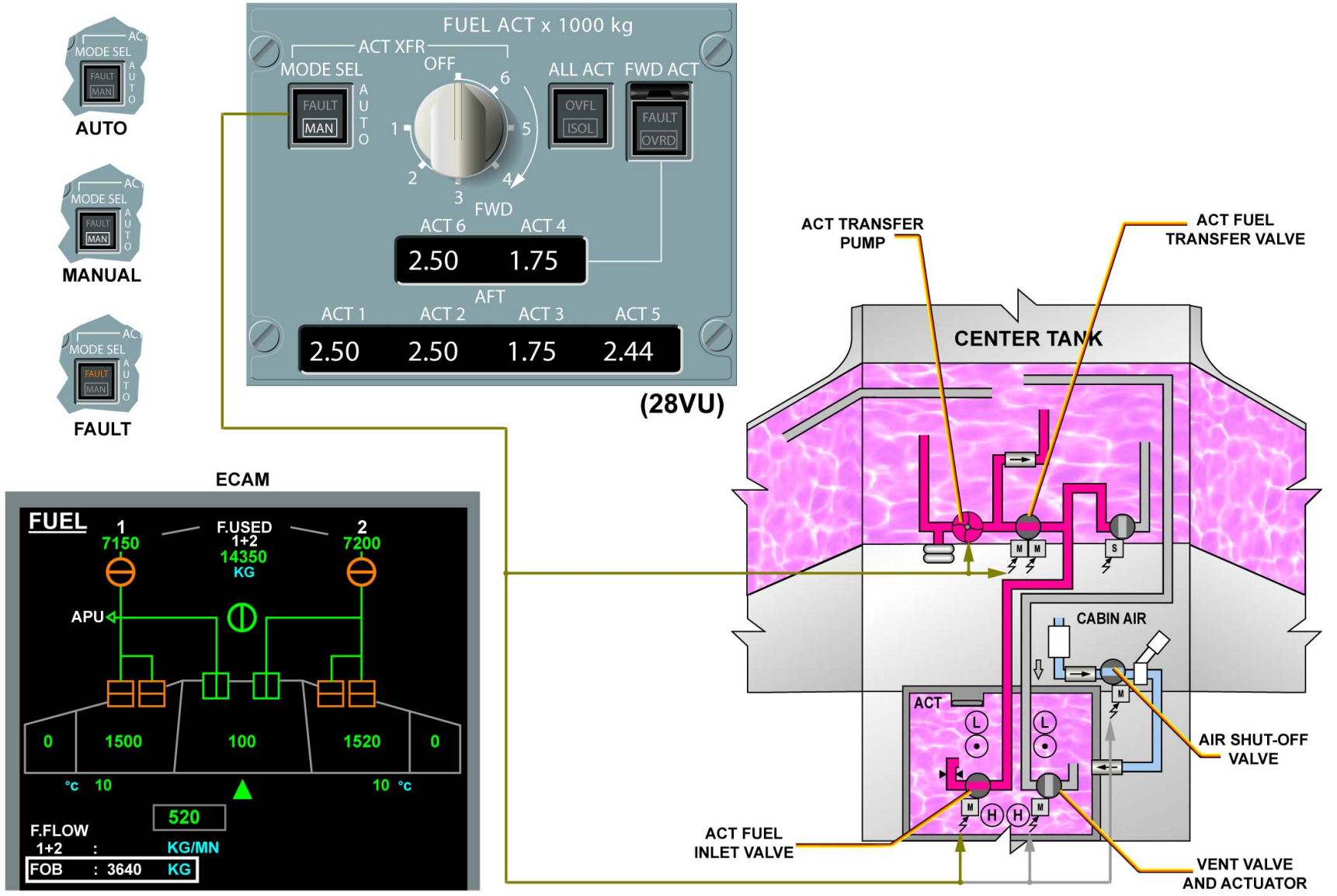
# ACT SYSTEM CONTROLS AND INDICATING (2)

## ACT CONTROL PANEL

The ACT XFR MODE SELECTOR P/BSW is on the cockpit overhead control panel and controls the ACT transfer system. For automatic transfer, the ACT MODE SELECTOR P/BSW is in the AUTO position. If the necessary conditions are met, the control circuit:
- closes the vent valve,
- opens the air shut-off valve,
- opens the fuel transfer valve,
- opens the fuel inlet valve.
- energizes the ACT transfer pump.

For manual transfer, the ACT MODE SELECTOR P/BSW must be pushed in until the MAN legend comes on. When the necessary conditions are met, the control circuit:
- opens the ACT fuel transfer valve,
- opens the ACT fuel inlet valve,
- energizes the ACT transfer pump.

The FAULT legend on the ACT MODE SELECTOR P/BSW comes on with an ECAM warning if a transfer fault occurs.
The FAULT legend on the ACT MODE SELECTOR P/BSW comes on with an related ECAM warning if during the automatic FWD transfer, any ACT empties before the previous ACT is empty. Or, if during the manual transfer mode any of the valves are in the incorrect position.



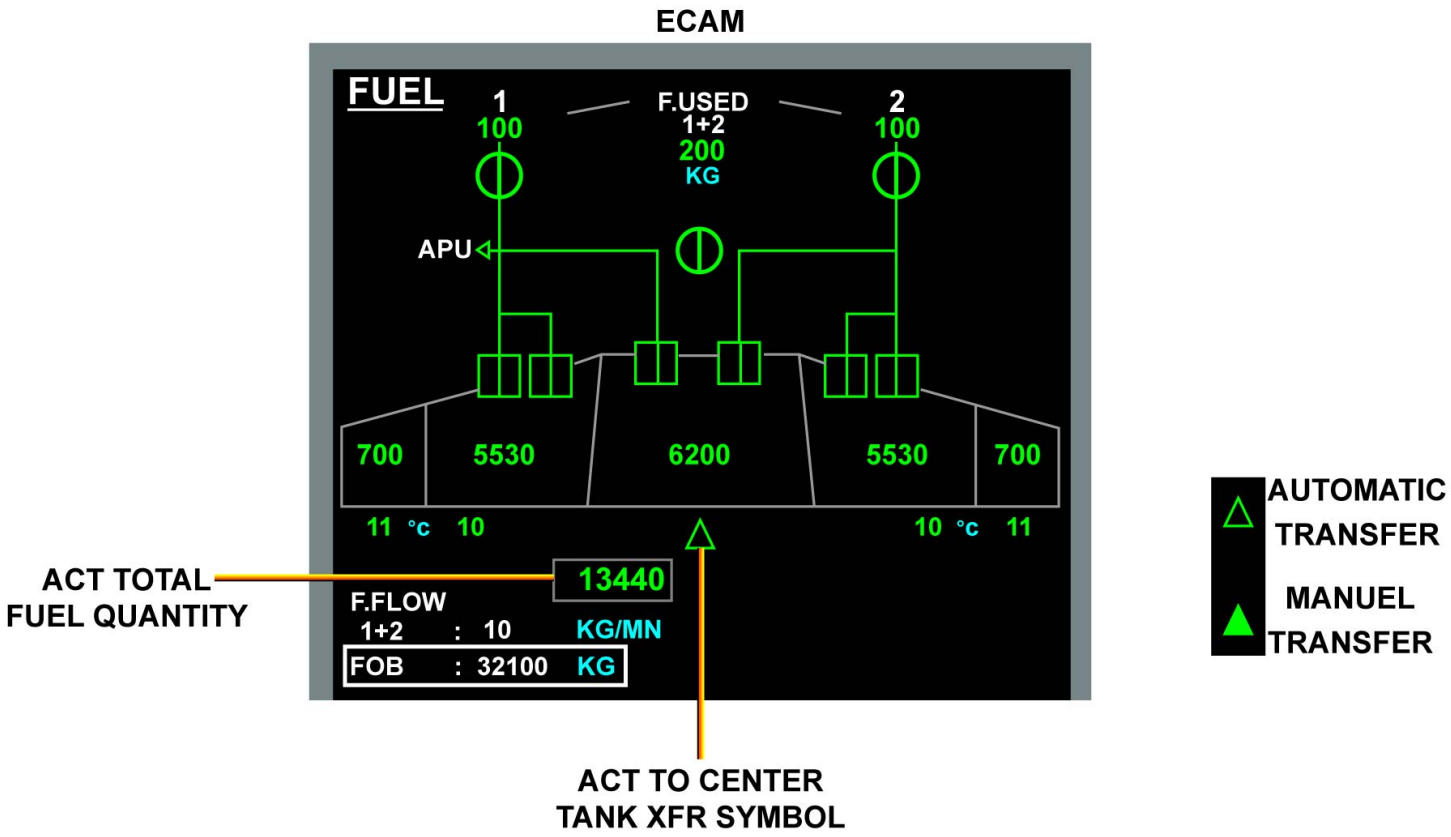

ACT CONTROL PANEL

# ACT SYSTEM CONTROLS AND INDICATING (2)

## ACT ECAM FUEL PAGE

The ACT parameters are displayed on the fuel system page of the ECAM display. The ACT fuel tanks total quantity is shown inside a grey box. The ACT to center tank transfer symbol appears when a fuel transfer is in progress. A triangle, normally green, indicates that the ACT fuel transfer is started towards the center tank. Some additional indications appear in case of failure of the automatic transfer or of the ACT transfer pump.

UGB13131 - U7ST0M0 - UM28I1000000005




NOTE: the values are based on a fuel specific gravity of 0.80 kg/l.

ACT ECAM FUEL PAGE

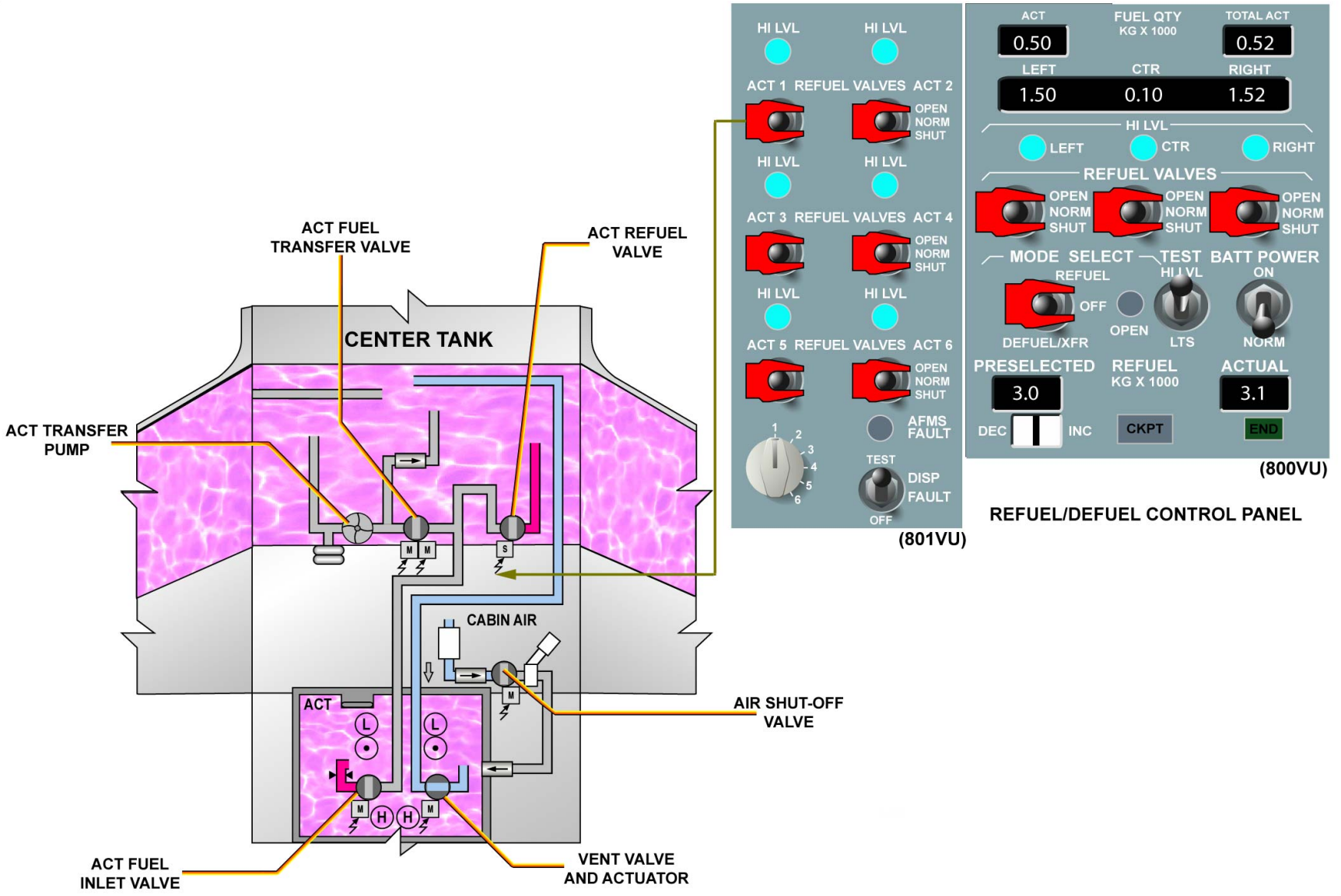
# ACT SYSTEM CONTROLS AND INDICATING (2)

## ACT REFUEL DEFUEL CONTROL PANEL (800VU)-(801VU)

The primary components on the refuel/defuel control panel are:
- the control panel 800VU
- the control panel 801VU
- the fuel quantity preselector
- the fuel quantity indicator.

The ACT refuel valve switches are on the outside refuel/defuel panel and control the status of the ACT refuel valve. When in NORM position, automatic refueling logic controls the refuel valves. Its status changes with the position of the mode selector switch and fuel pressure.
When in OPEN position, the valve will open with fuel pressure.
When in SHUT position, the refuel valve status does not change with the position of the mode selector switch.
The fuel quantity rotary selector switch is on the outside refuel/defuel panel and lets the fuel quantity indicator show the different fuel quantities. If you select the ACT with the rotary selector switch, the indicator will show the fuel quantity of the selected ACT.
When the system detects a high fuel level in the ACT, the HI LVL blue light comes on.

UGB13131 - U7ST0M0 - UM28I1000000005




ACT REFUEL DEFUEL CONTROL PANEL (800VU)-(801VU)

# ACT SYSTEM D/O (3)

## GENERAL

The Additional Center Tanks (ACTs) are extensions of the center tank and are installed in the aft and FWD cargo compartments. ACTs to center tank transfer is automatically controlled in flight. Cabin air pressure pressurizes the ACTs for the transfer.

## TRANSFER

Automatic transfer is the normal mode in flight. If there is system failure or flight at low level or on ground, manual transfer mode is selectable.
The automatic transfer occurs when:
- the A/C is in flight,
- the slats are retracted,
- the MODE SELector P/BSW is in the AUTO position,
- one ACT low level sensor minimum is wet,
- the center tank fuel level drops to 5000 Kg (11030 lb). When the fuel level reaches 5750 kg (12700 lb), the transfer stops, until it drops again to 5000 kg (11030 lb).

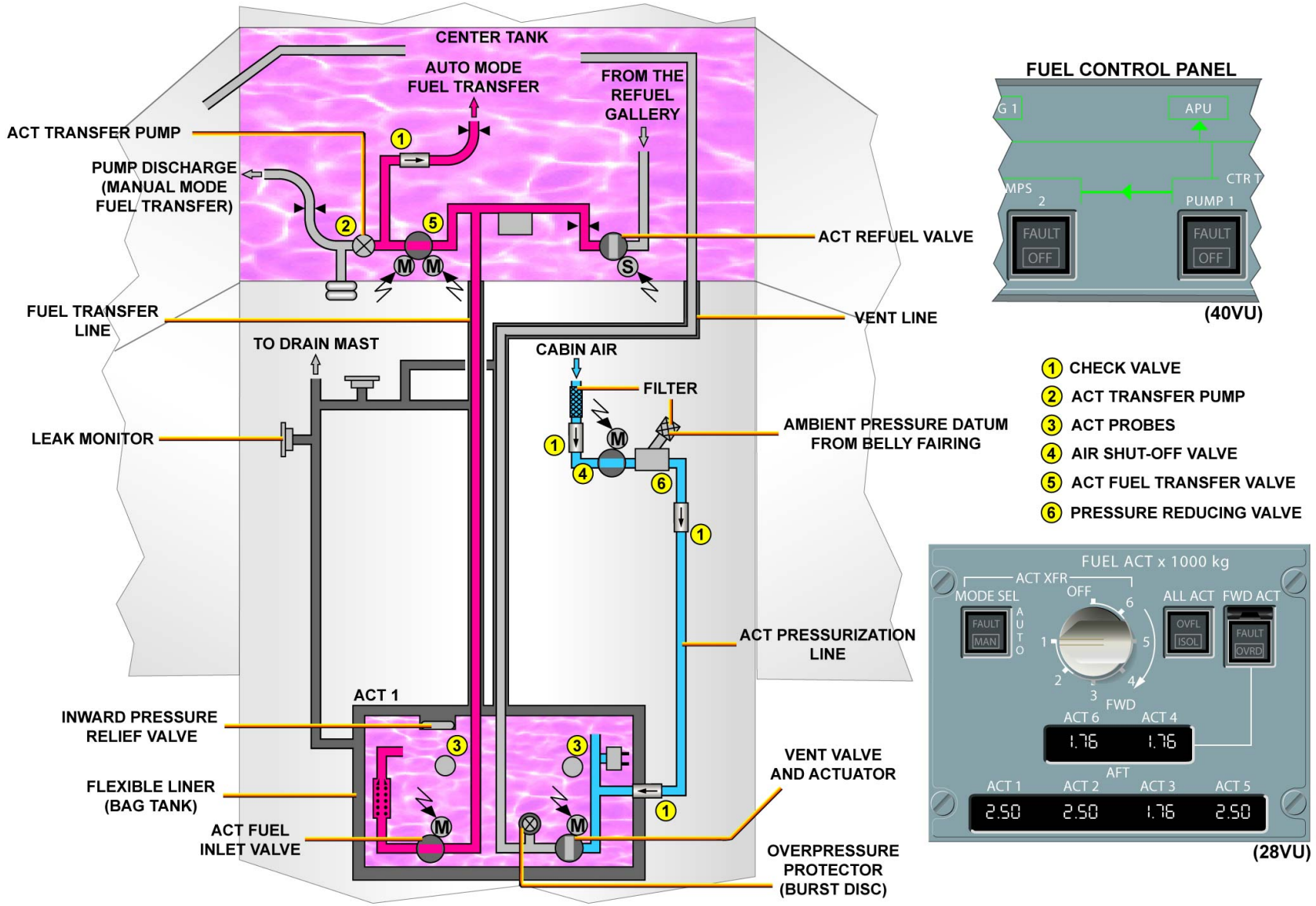
These conditions open the fuel inlet valve and the fuel transfer valve on the fuel transfer line. For manual transfer, the MODE SEL P/BSW must be pushed and the rotary selector set to the ACT that is to be transferred. This condition opens the fuel inlet valve, the fuel transfer valve and only if the aircraft is on ground, the ACT transfer pump is energized. In flight, the cabin pressure will be used to transfer the fuel.

## PRESSURIZATION SYSTEM

When the automatic fuel MODE SEL transfer is selected, the ACT air shutoff valve opens and lets the air pressure from the cargo compartment pressurize the ACTs. Fuel is then transferred from the ACT to the center tank by pressurization. The pressure-reducing valve regulates the ACTs air pressure to around 0.34 bar (5 psi) more than ambient air pressure.

The check valves prevent the vapor from the ACTs in the cabin. The filter cleans the air that goes into the tank.

UGB13131 - U7ST0M0 - UM28D7000000003



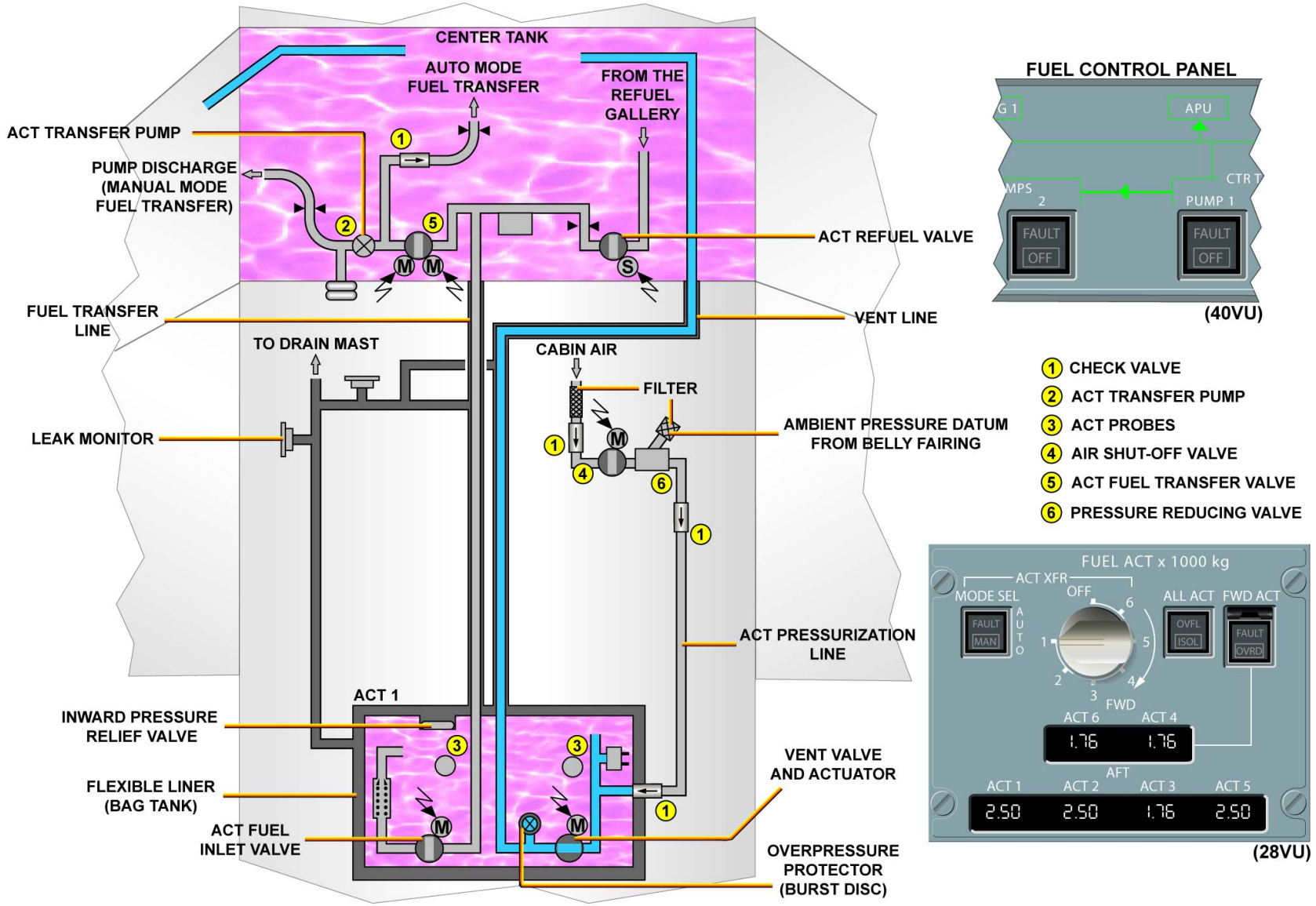

GENERAL ... PRESSURIZATION SYSTEM

# ACT SYSTEM D/O (3)

## VENT SYSTEM

When the automatic fuel MODE SEL transfer is selected, the ACT vent valve closes to pressurize the ACTs. If the ACT pressure is too high, the overpressure protector depressurizes the ACTs through the vent line. The inward pressure-relief valve gives protection to the bladder bag from excessive inward pressure during descent and emergency descent. The center tank venting system releases air of the ACTs to the atmosphere through the shrouded ACT vent line.

UGB13131 - U7ST0M0 - UM28D7000000003




VENT SYSTEM

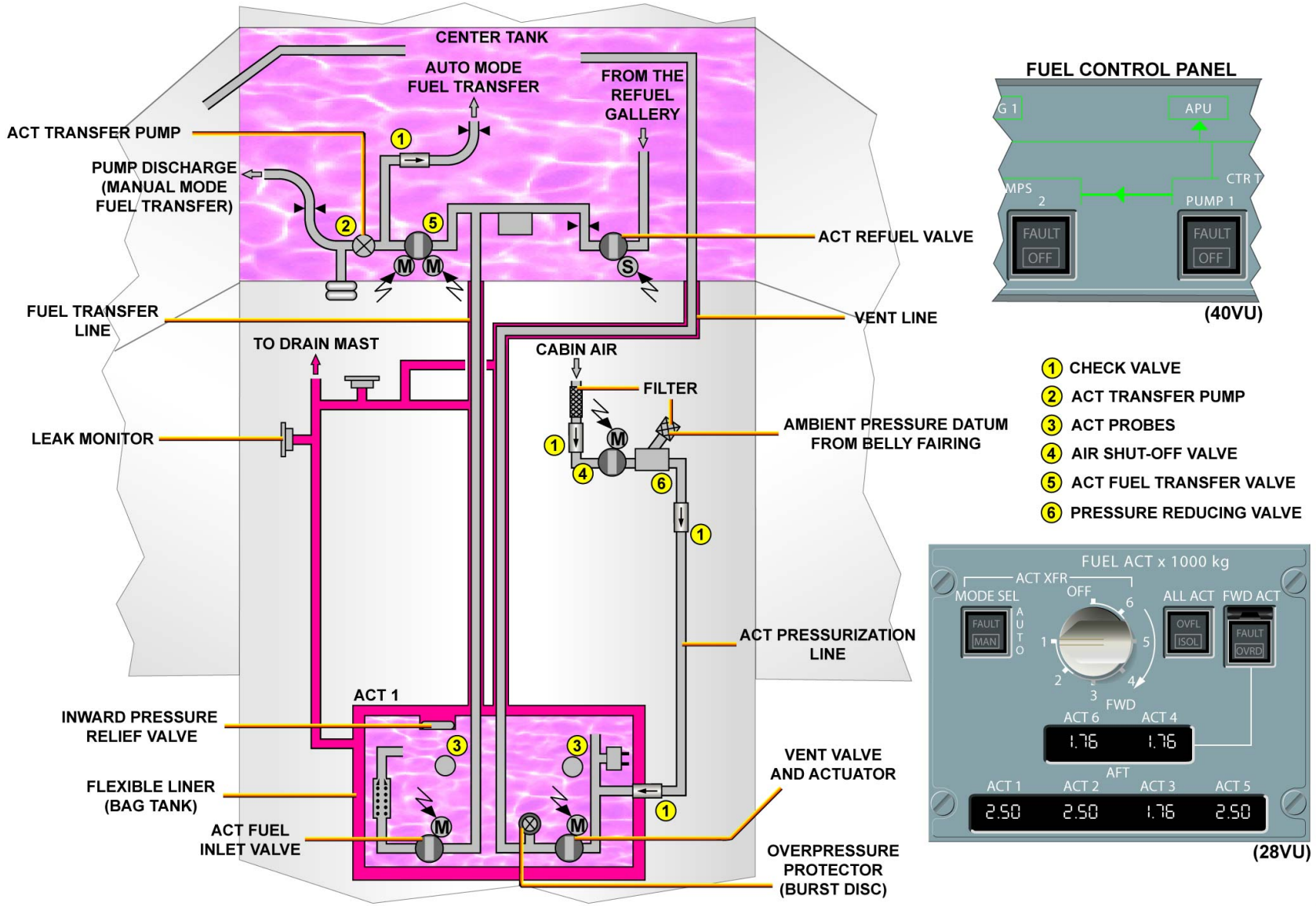
UGB13131 - U7ST0M0 - UM28D7000000003

# ACT SYSTEM D/O (3)

## DRAIN SYSTEM

A drain line connects the refuel/defuel line, the vent line and the space between the ACT bladder tank and the ACT structure to the A/C drain mast. If a fuel leak occurs, the fuel goes to the atmosphere through the drain line. The drain line has leak monitors that can examine if there is a fuel leakage in the ACT system.

UGB13131 - U7ST0M0 - UM28D7000000003



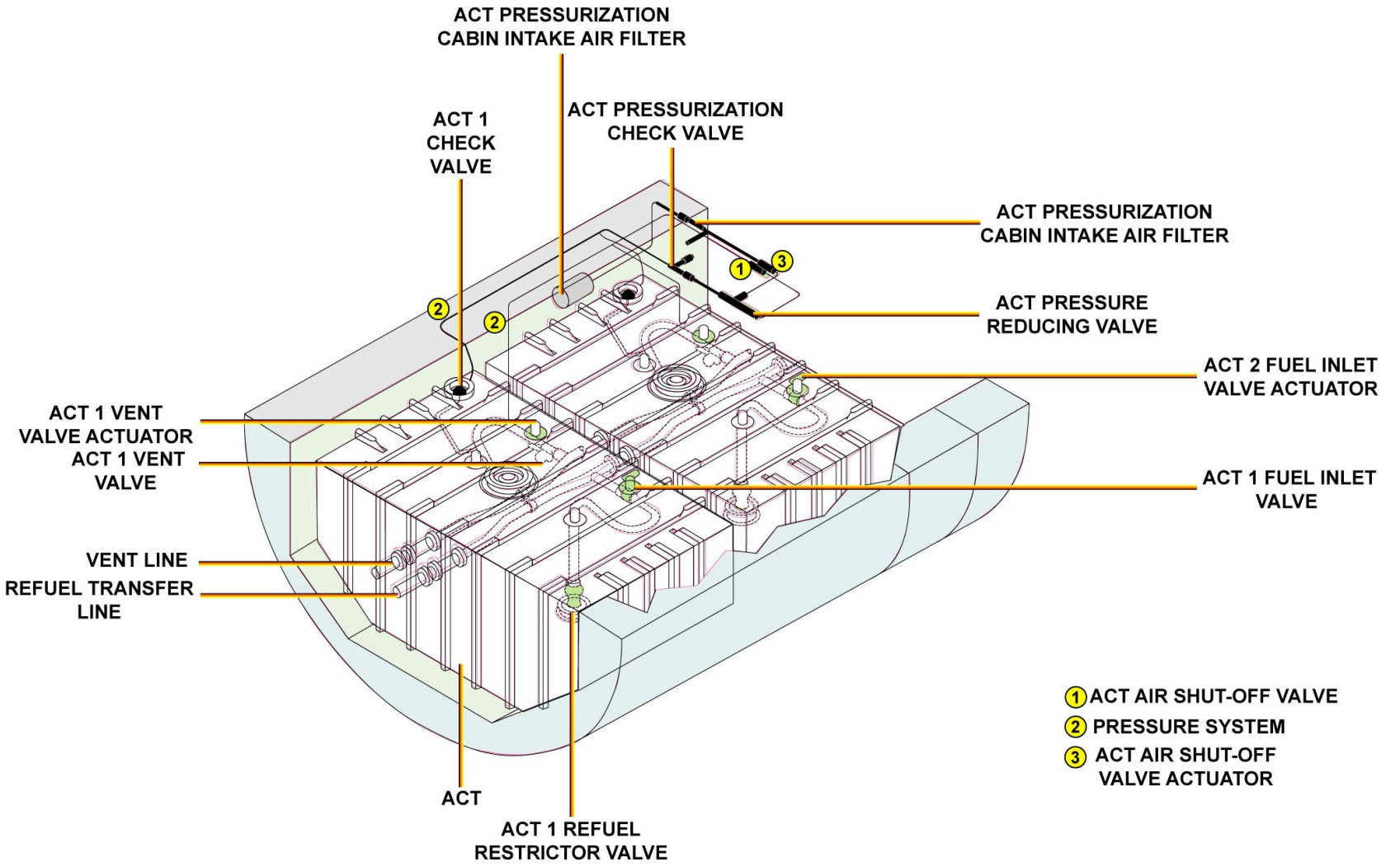

DRAIN SYSTEM

# 1 ACT TO 2 ACTS DIFFERENCES (3)

## GENERAL

The A319 A320 A321 can be equipped with a second Additional Center Tank (ACT) called ACT 2 installed in the aft cargo compartment behind ACT 1. ACT 1 and ACT 2 are identical. Each ACT can hold approximately 2349 kg of fuel. The refuel/defuel system, the vent system and the pressurization system are identical to those fitted on A/C equipped with only one ACT.

UGB13131 - U7ST0M0 - UM28R1000000001


ACT PRESSURIZATION CABIN INTAKE AIR FILTER
ACT 1 CHECK VALVE
ACT PRESSURIZATION CHECK VALVE
ACT PRESSURIZATION CABIN INTAKE AIR FILTER
ACT PRESSURE REDUCING VALVE
ACT 2 FUEL INLET VALVE ACTUATOR
ACT 1 VENT VALVE ACTUATOR
ACT 1 VENT VALVE
ACT 1 FUEL INLET VALVE
VENT LINE
REFUEL TRANSFER LINE
ACT
ACT 1 REFUEL RESTRICTOR VALVE
1 ACT AIR SHUT-OFF VALVE
2 PRESSURE SYSTEM
3 ACT AIR SHUT-OFF VALVE ACTUATOR

GENERAL

UGB13131 - U7ST0M0 - UM28R1000000001

# 1 ACT TO 2 ACTS DIFFERENCES (3)

## CONTROL AND INDICATING

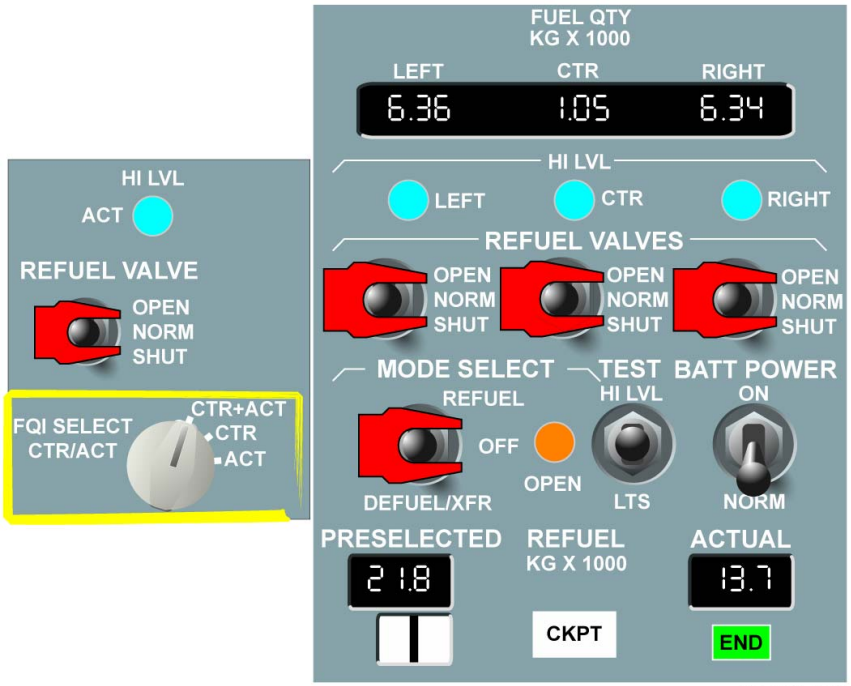
When we add an ACT in the A/C, the control and indicating change.

### CONTROL

The Fuel Quantity Indicator (FQI) SELECT switch has been removed from the refuel/defuel panel and has been replaced by two ACT FQIs on the Multi Tank Indicator (MTI). A second REFUEL VALVE switch and HIgh LeVeL (HI LVL) light have also been added.

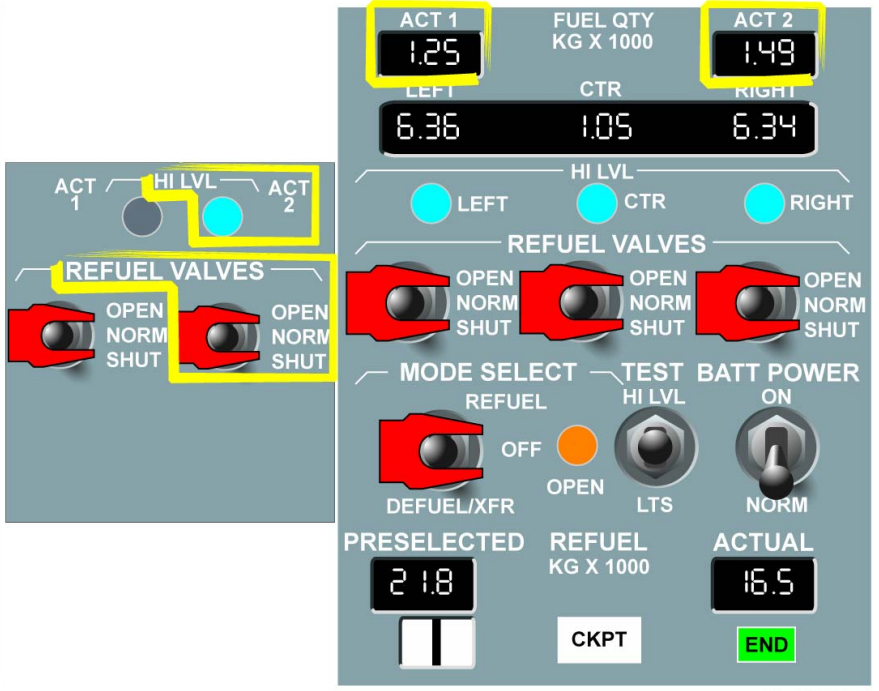
UGB13131 - U7ST0M0 - UM28R1000000001

**ACT 1 REFUEL/DEFUEL CONTROL PANEL**




(800VU)

**ACT 2 REFUEL/DEFUEL CONTROL PANEL**




(800VU)

CONTROL AND INDICATING - CONTROL

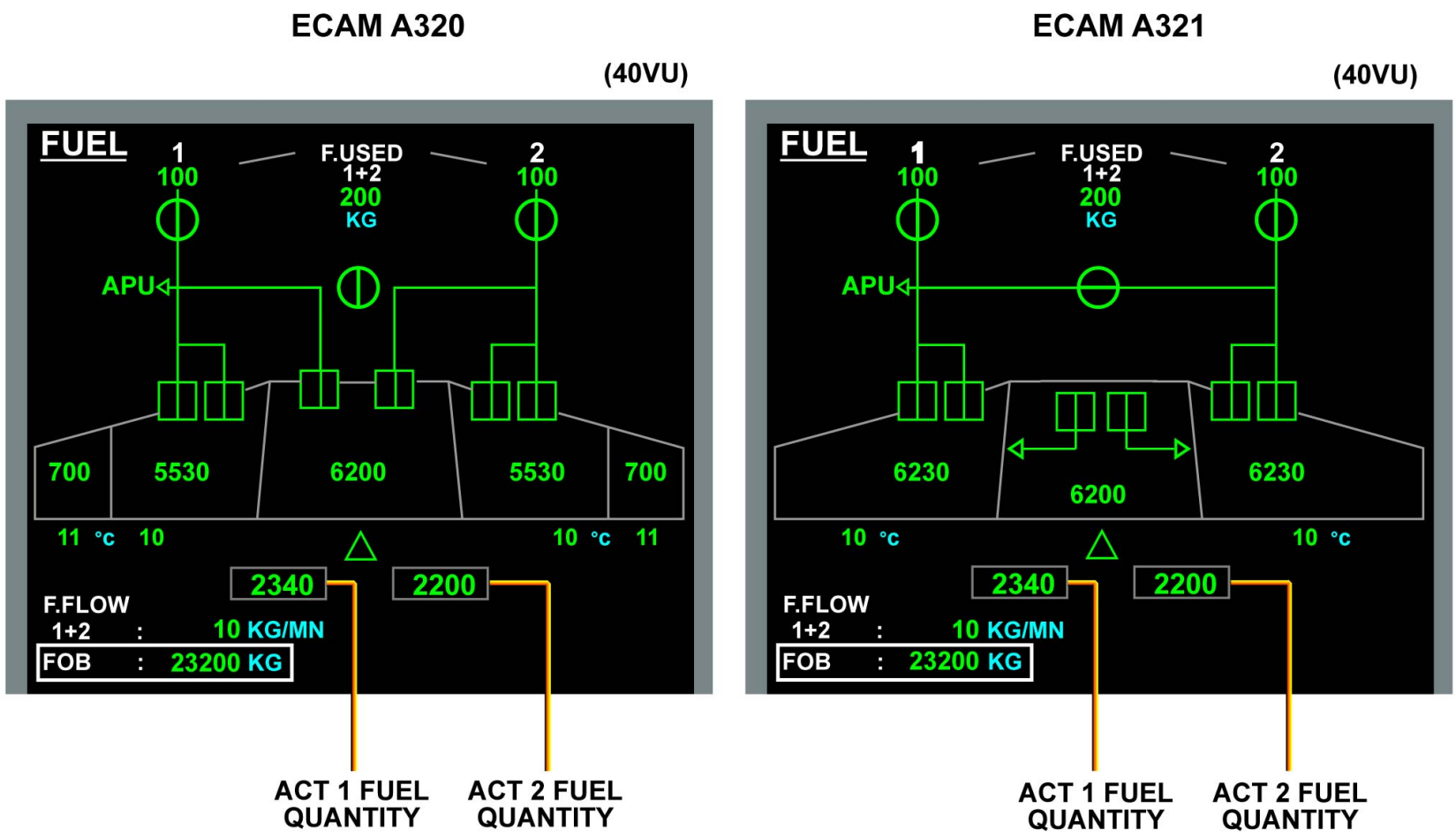
# 1 ACT TO 2 ACTS DIFFERENCES (3)

## CONTROL AND INDICATING (continued)

### INDICATING

The two ACTs are shown on the ECAM FUEL page with their fuel quantity.

UGB13131 - U7ST0M0 - UM28R1000000001




△ ACT TO CENTER TANK XFR SYMBOL

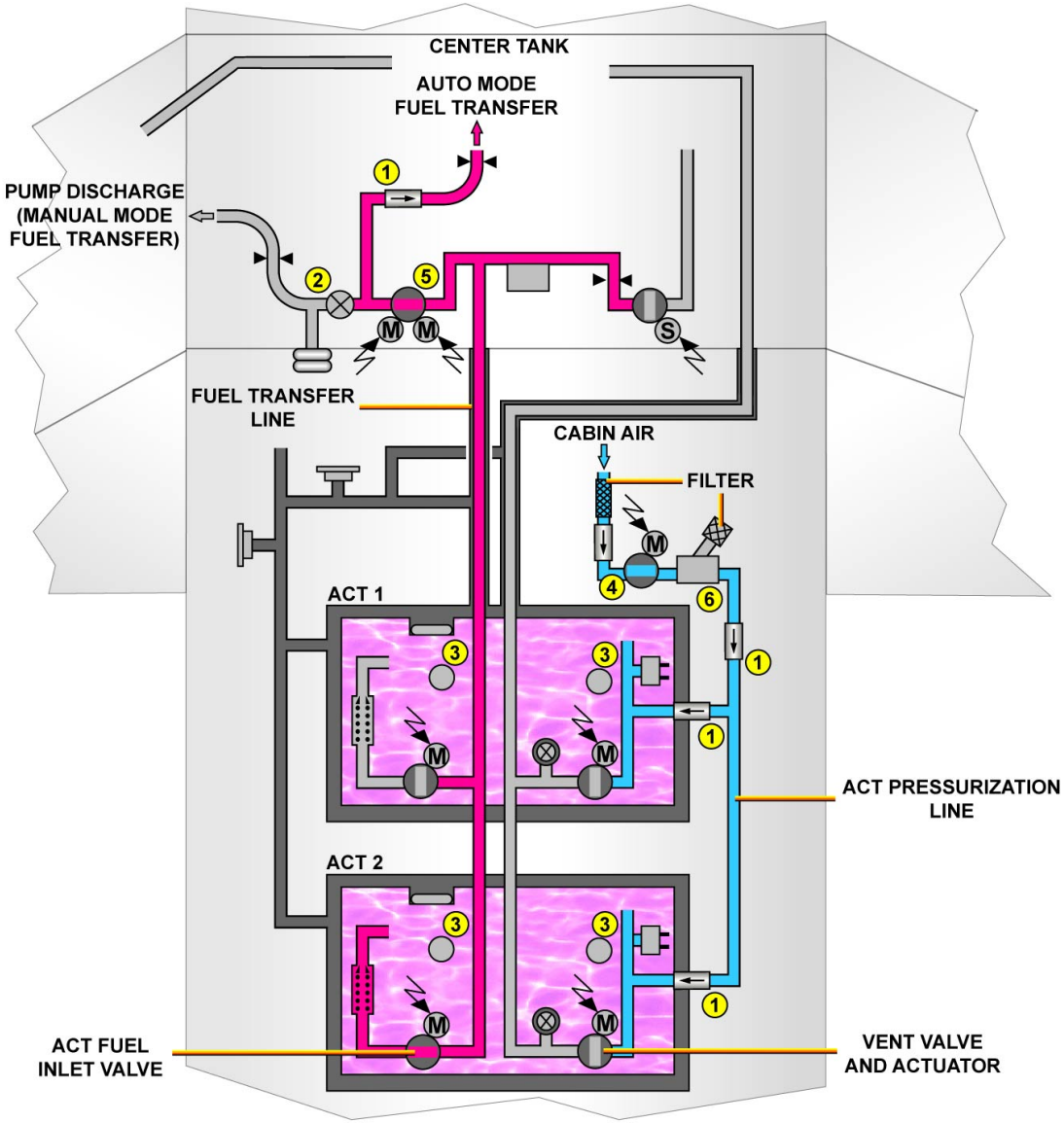
CONTROL AND INDICATING - INDICATING

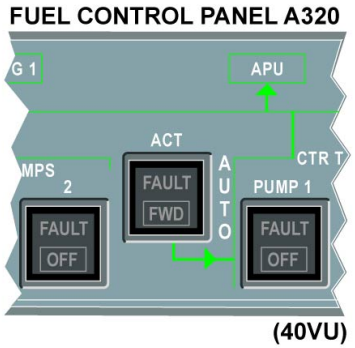
# 1 ACT TO 2 ACTS DIFFERENCES (3)

## FUEL FORWARD TRANSFER

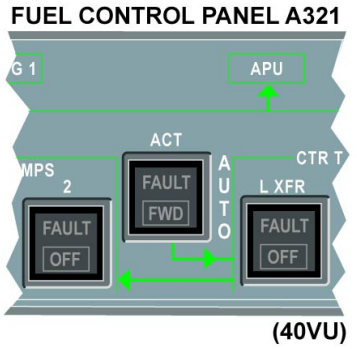
Automatic and manual fuel forward transfer with two ACTs is carried out in exactly the same way as with one ACT except that ACT 2 will be emptied first until the ACT 2 low level sensors are dry.

UGB13131 - U7ST0M0 - UM28R1000000001




1. CHECK VALVE
2. ACT TRANSFER PUMP
3. ACT PROBES
4. AIR SHUT-OFF VALVE
5. ACT FUEL TRANSFER VALVE
6. PRESSURE REDUCING VALVE




FUEL FORWARD TRANSFER

# 1 ACT TO 2 ACTS DIFFERENCES (3)

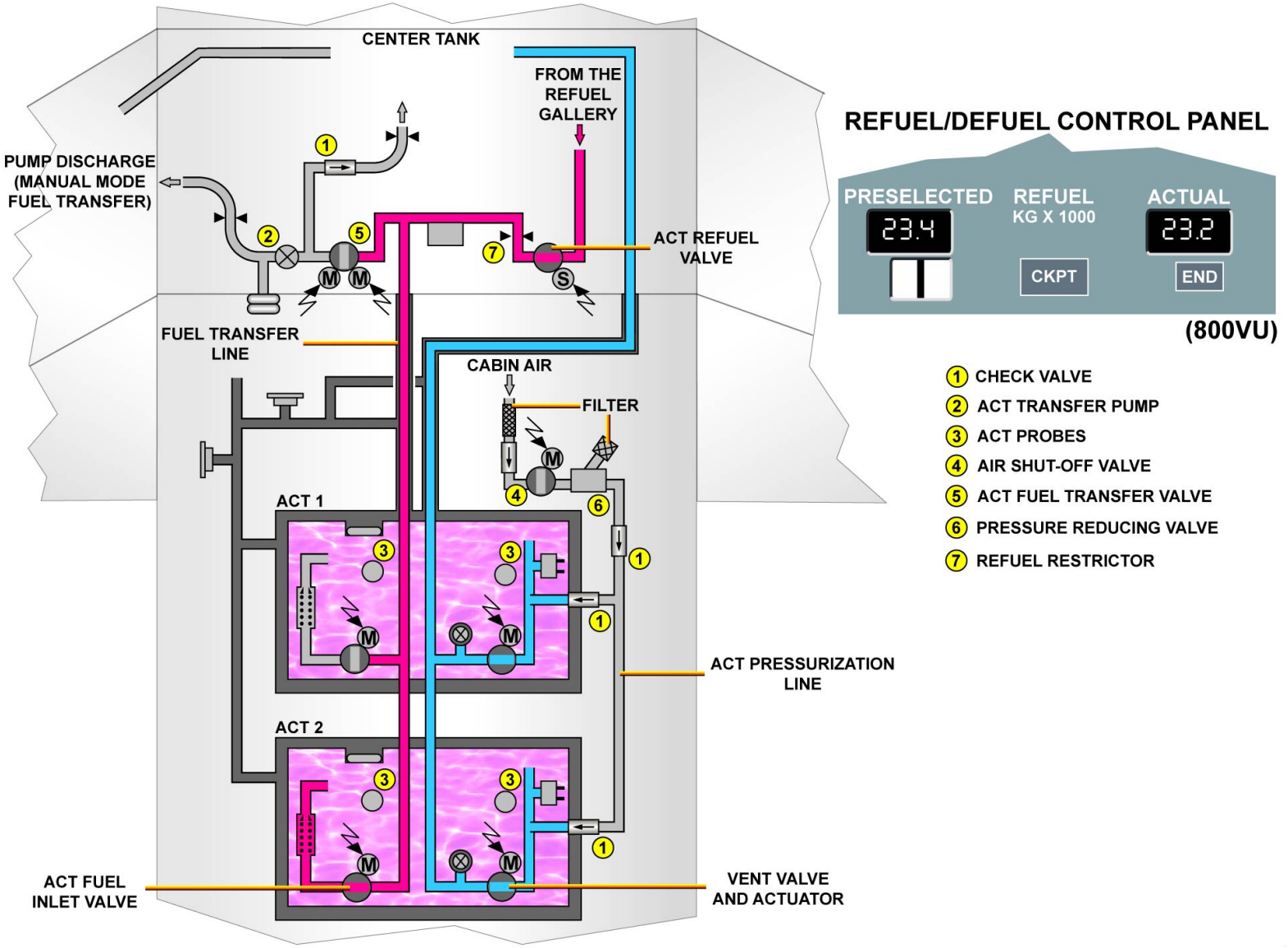
## REFUEL AND DEFUEL

In case we put another ACT in the A/C, we can see the differences during the refuel and defuel operation.

### REFUEL

The ACTs are refueled at the same time as the other tanks. Depending on the pre-selected fuel quantity, fuel will be added first to the wing tanks, then to the center tank, then to ACT 1 and then to ACT 2.

UGB13131 - U7ST0M0 - UM28R1000000001




REFUEL AND DEFUEL - REFUEL

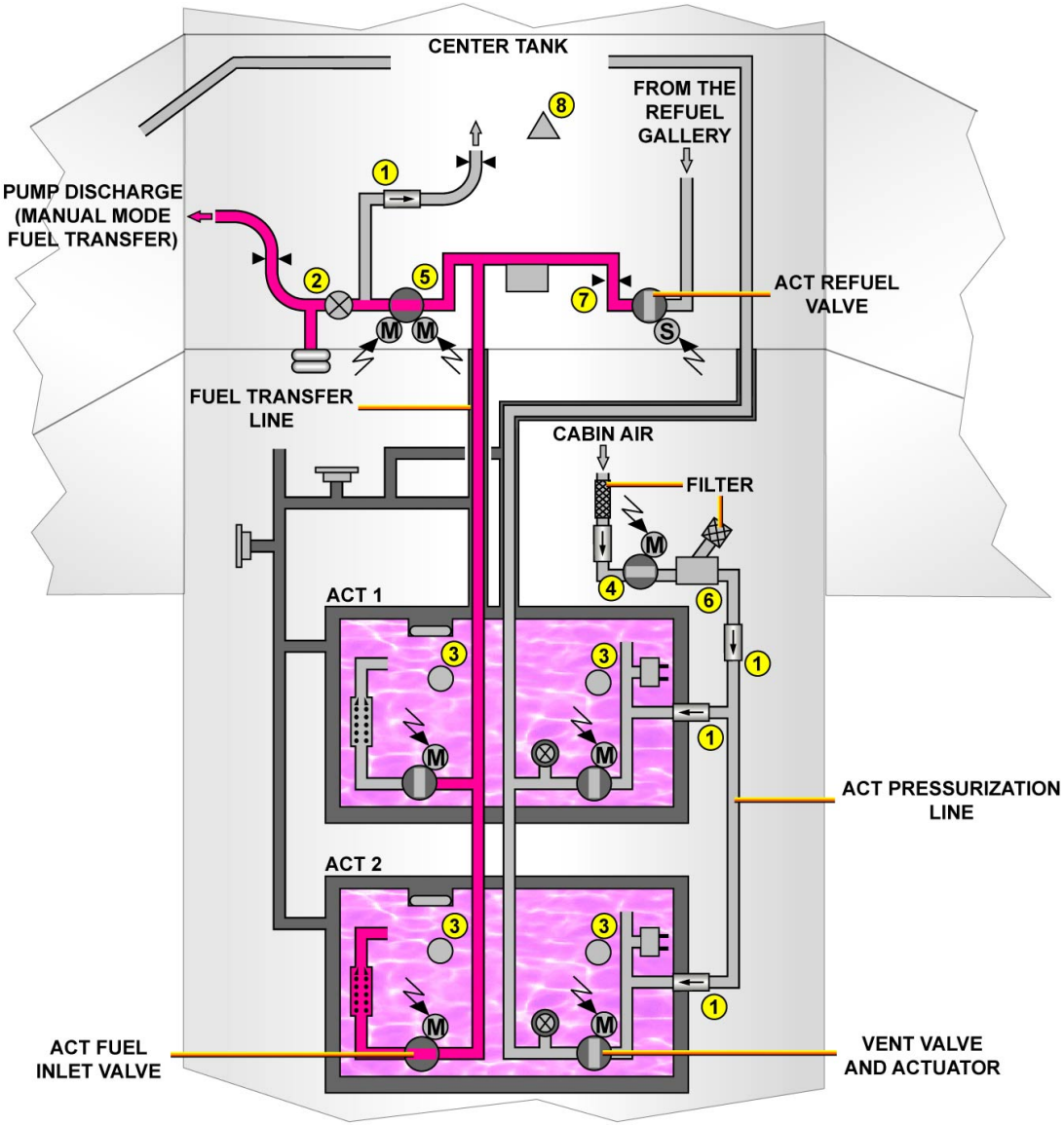
# 1 ACT TO 2 ACTS DIFFERENCES (3)

## REFUEL AND DEFUEL (continued)

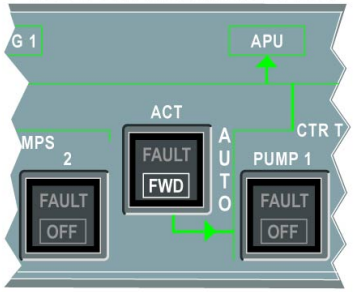
### DEFUEL

The ACTs are defueled by moving fuel from the ACTs to the center tank. The center tank high level sensor must be dry to ensure there is enough space in the center tank for fuel from the ACTs.

UGB13131 - U7ST0M0 - UM28R1000000001



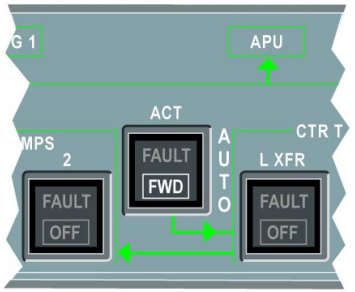

FUEL CONTROL PANEL A320




(40VU)

1. CHECK VALVE
2. ACT TRANSFER PUMP
3. ACT PROBES
4. AIR SHUT-OFF VALVE
5. ACT FUEL TRANSFER VALVE
6. PRESSURE REDUCING VALVE
7. REFUEL RESTRICTOR
8. CENTER TANK HIGH LEVEL SENSOR

FUEL CONTROL PANEL A321




(40VU)

REFUEL AND DEFUEL - DEFUEL

# ACT REFUEL/DEFUEL SYSTEM PRESENTATION (2)

## GENERAL

Different procedures are used to refuel/defuel A/C. For refueling:
- pressure refuel: automatic and manual,
- overwing refuel: gravity.

For defueling:
- pressure defuel: main pumps operation.

In automatic operation, the Additional Center Tank (ACT) will only be refueled if the pre-selected fuel quantity is greater than the maximum capacity of both the center tank and the wing tanks.

## ACT REFUEL VALVE

A solenoid controlled refuel valve controls the fuel flow into the ACTs. If the refuel valve does not operate correctly, the valve can be open using its manual override-button.

## ACT FUEL INLET VALVE

Installed in the ACT fuel supply line, the ACT fuel inlet valve opens when fuel has to be moved from the ACT to the center tank or vice-versa.

## REFUEL RESTRICTOR VALVE

Installed in the fuel line inside the ACTs, the restrictor valve limits the refuel rate but not the defuel rate of the ACTs.

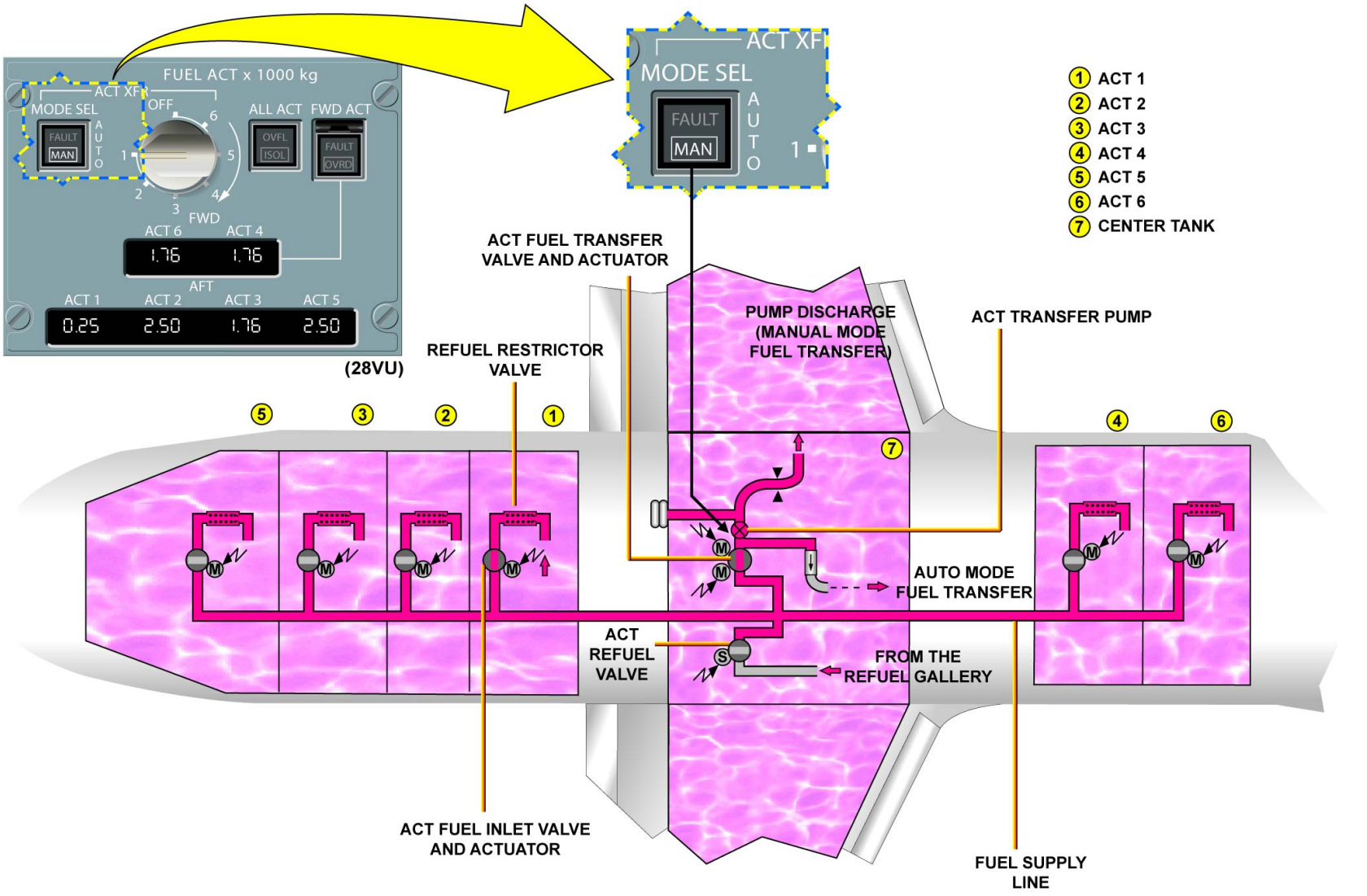
## ACT FUEL TRANSFER VALVE

Installed in the fuel line to the center tank, the ACT fuel transfer valve opens in case of automatic or manual fuel transfer.

## ACT TRANSFER PUMP

The ACT transfer pump operates when a manual fuel transfer is selected.

UGB13131 - U7ST0M0 - UM28PA00000002




GENERAL ... ACT TRANSFER PUMP

# ACT REFUEL/DEFUEL CONTROL PANEL (2)

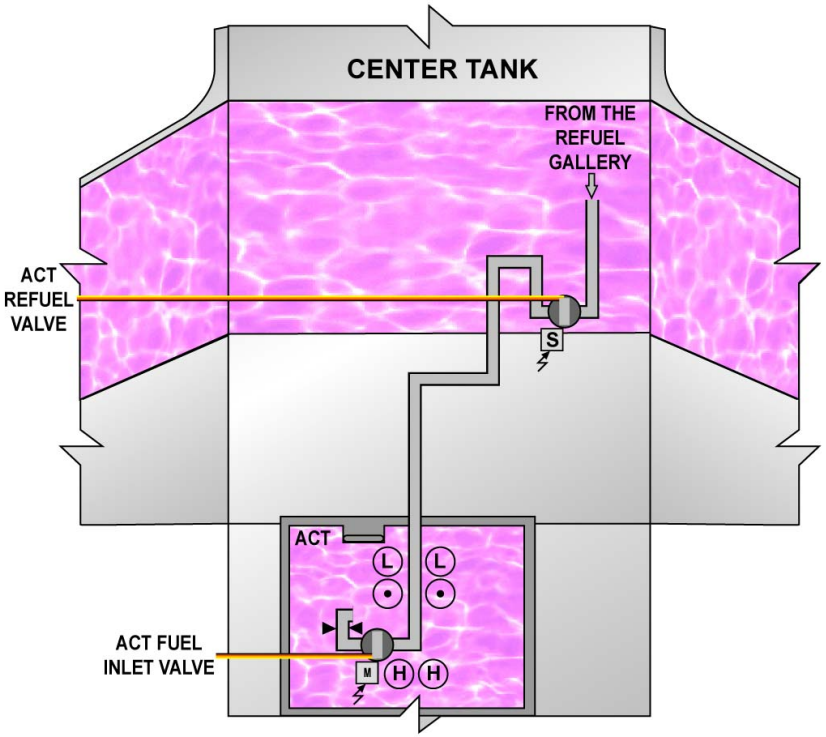
## ACT HIGH LEVEL LIGHT

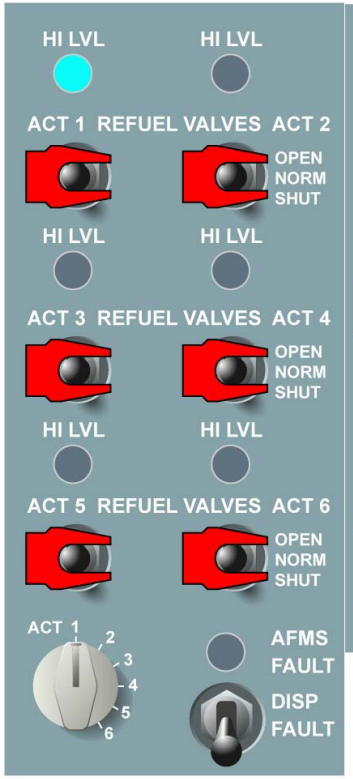
The blue Additional Center Tank (ACT) HIgh LeVeL (HI LVL) light comes on when the high-level sensors are covered. The refuel valve closes.

## ACT REFUEL VALVE SELECTOR

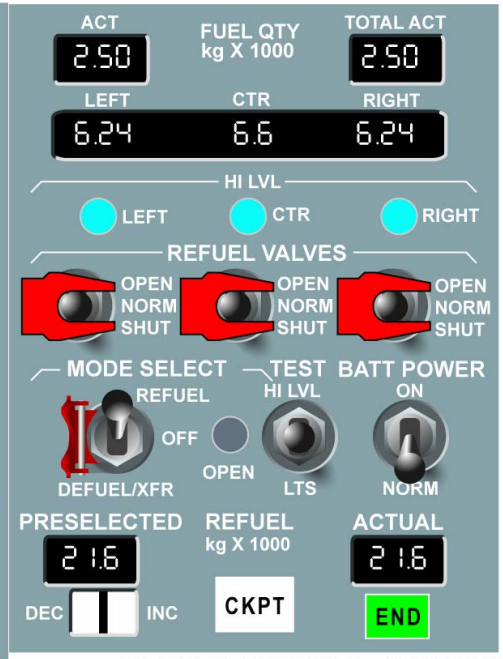
When in Normal (NORM) position, the automatic refueling logic controls the ACT refuel valve. When in OPEN position, the ACT refuel valve opens when the MODE SELECT SWITCH is set to the REFUEL POSITION and with fuel pressure. If the MODE SELECT SWITCH is set to REFUEL, the ACT refuel valve closes at ACT high level. When in SHUT position, the ACT refuel valve closes.

UGB13131 - U7ST0M0 - UM28I2000000002

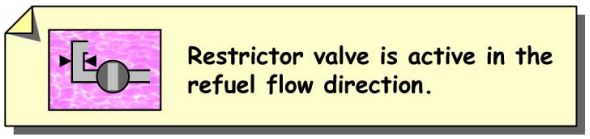



(801VU)




REFUEL/DEFUEL (800VU) CONTROL PANEL




- ⊙ FQI PROBE
- Ⓗ HIGH LEVEL SENSOR
- Ⓛ LOW LEVEL SENSOR

NOTE: the values are based on a fuel specific gravity of 0.80 kg/l.

ACT HIGH LEVEL LIGHT & ACT REFUEL VALVE SELECTOR

# ACT TO CTR TK FUEL XFR OPERATION (3)

## PREPARATION FOR FUEL TRANSFER

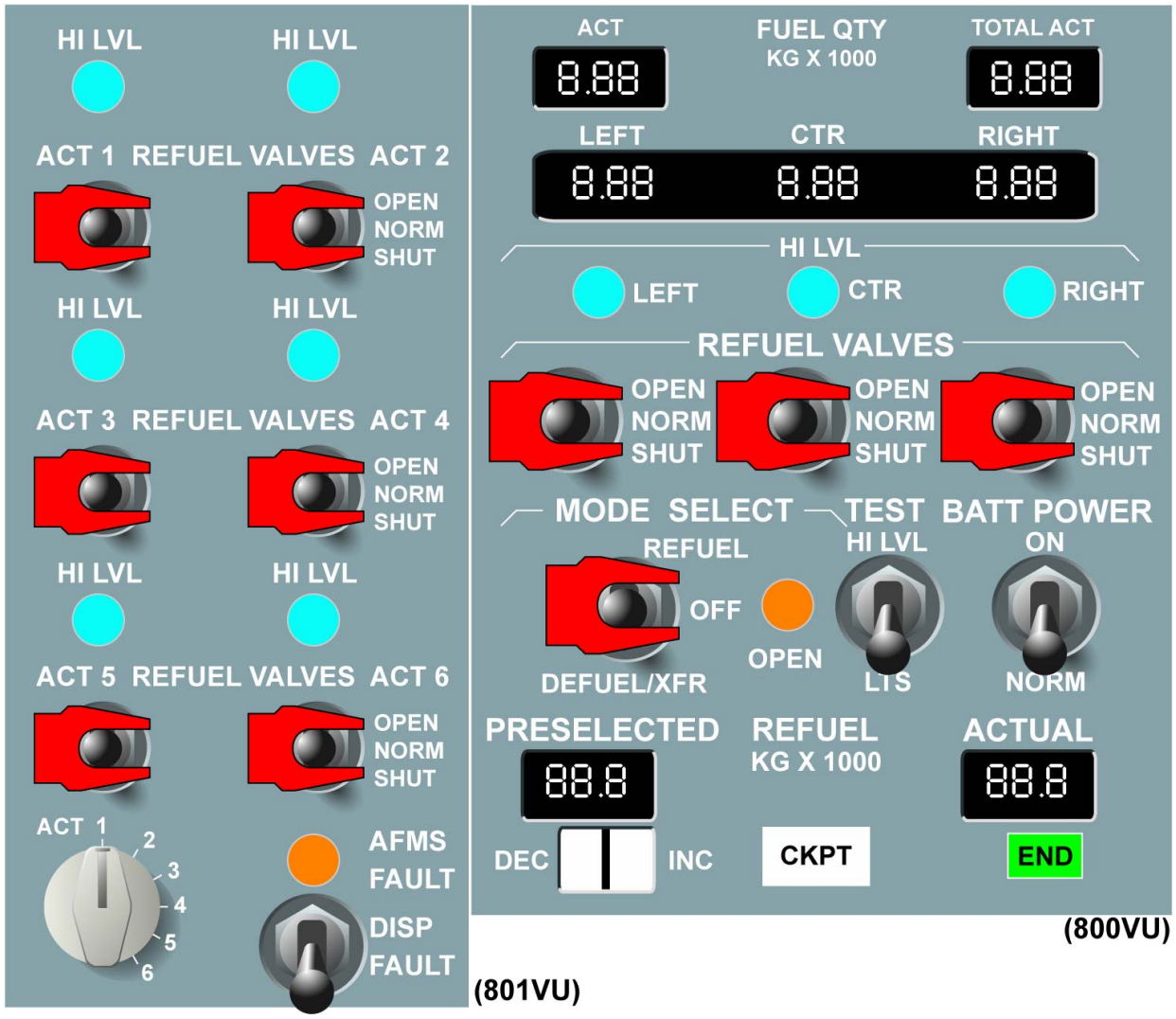
We will present the various tests before the stage of fuel transfer.

### LIGHT TEST

To do the light test of the FUEL QTY panel, the TEST selector must be set to the Lights (LTS) position:
- all the panel lights come on,
- the fuel-quantity displays show eights.

UGB13131 - U7ST0M0 - UM28D8000000005

REFUEL/DEFUEL CONTROL PANEL




PREPARATION FOR FUEL TRANSFER - LIGHT TEST

# ACT TO CTR TK FUEL XFR OPERATION (3)

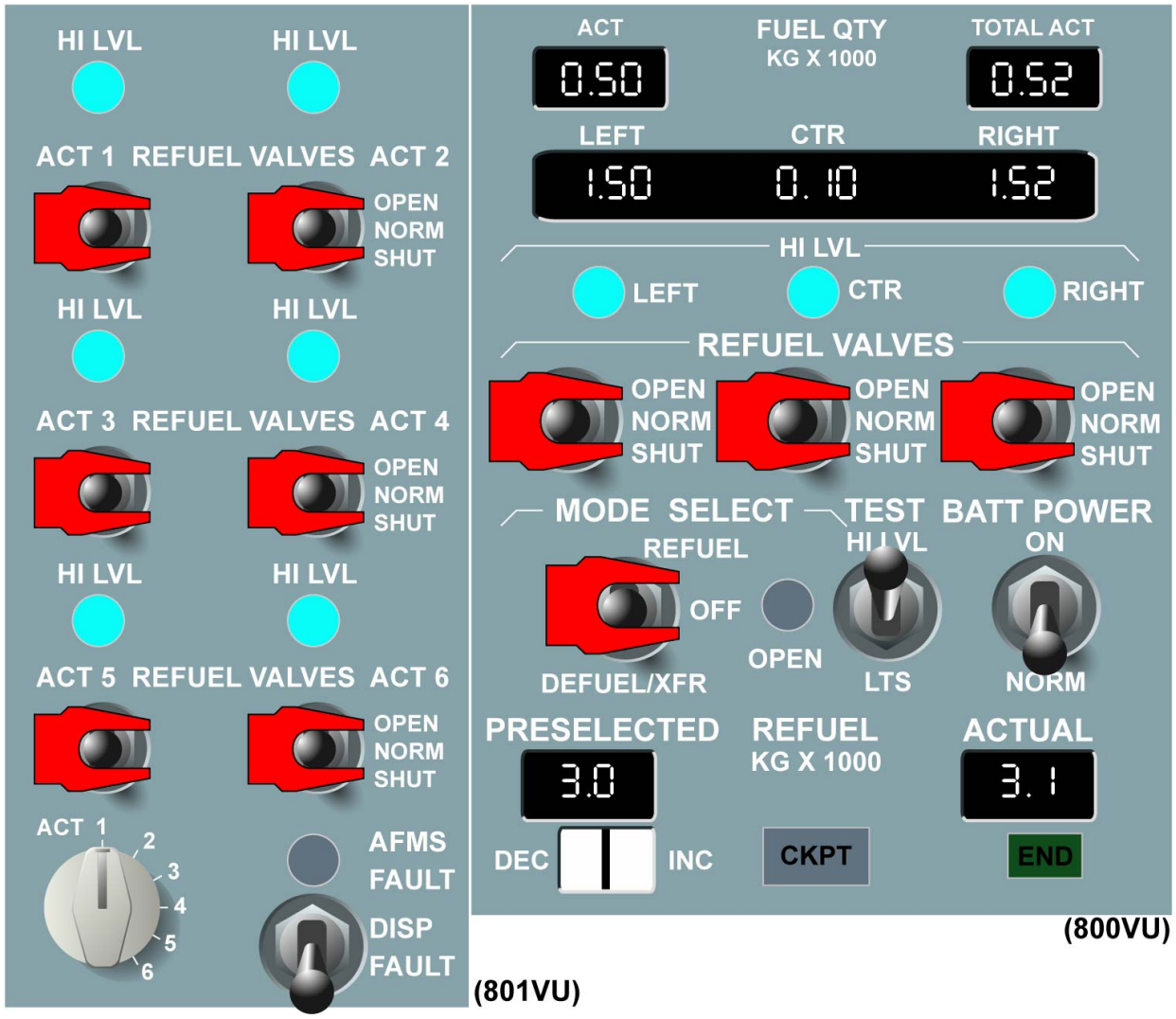
## PREPARATION FOR FUEL TRANSFER (continued)

### HIGH LEVEL TEST

To do the high-level light test, the TEST selector must be set to the HIgh LeVeL (HI LVL) position:
- the state of the HI LVL lights changes.

UGB13131 - U7ST0M0 - UM28D800000005

REFUEL/DEFUEL CONTROL PANEL




PREPARATION FOR FUEL TRANSFER - HIGH LEVEL TEST

# ACT TO CTR TK FUEL XFR OPERATION (3)

**FUEL TRANSFER**

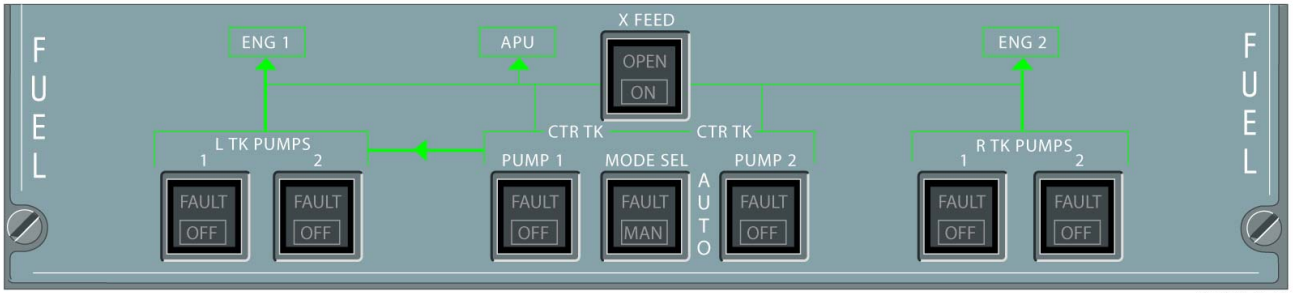
WARNING: OBEY THE FUEL SAFETY PROCEDURES.

NOTE: Make sure that the space in the center tank is sufficient to contain the fuel from the Additional Center Tank (ACT).

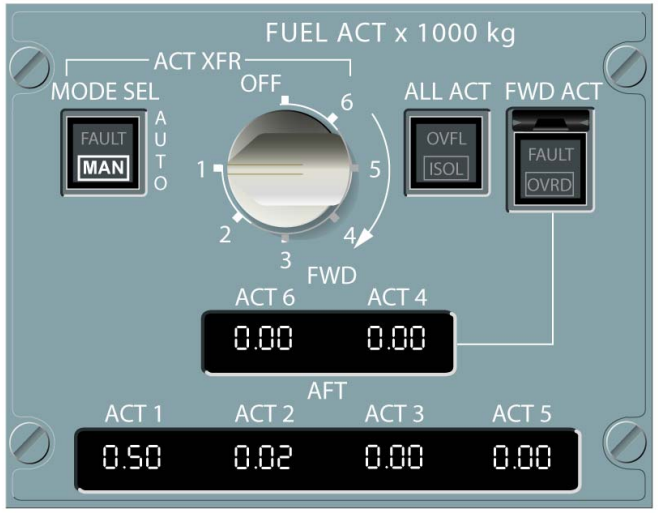
If the quantity of fuel to be moved is more than the capacity of the center tank:

- transfer the fuel in the center tank to the wing tanks.
- monitor the fuel quantity indications on the ECAM lower DU. Stop the movement of fuel when there is sufficient space in the center tank.
- on the FUEL ACT panel, push in the ACT XFR MODE SELect P/BSW. Make sure that the P/BSW MANual light comes on.
- on the FUEL ACT panel, set the rotary selector switch to the applicable ACT.
- on the FUEL ACT panel, make sure that the ACT quantity indication decreases.
- on the FUEL ACT panel, when the applicable ACT quantity indication shows zero:
- set the ACT rotary selector switch to OFF
- release (out) the ACT XFR MODE SEL P/BSW. Make sure that the P/BSW MAN light goes out.

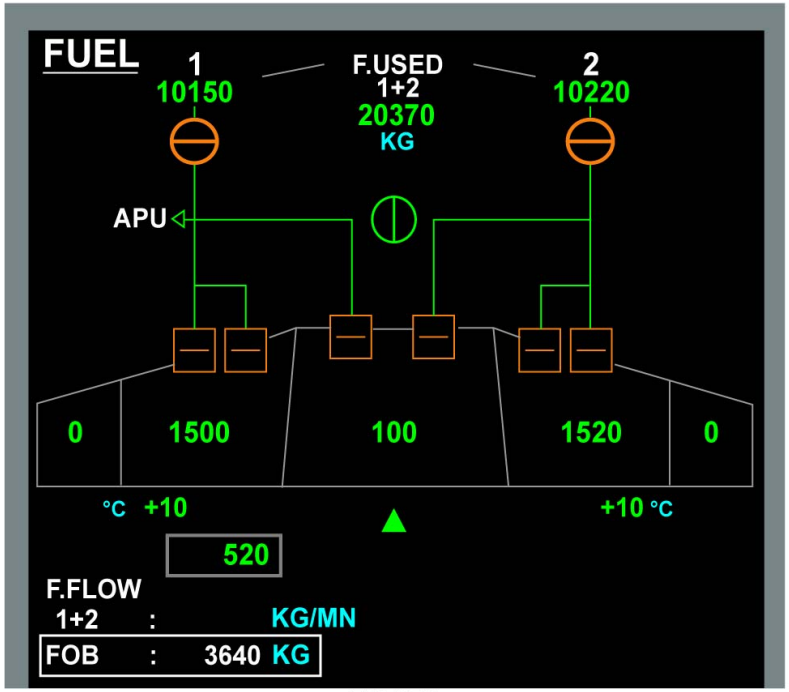
UGB13131 - U7ST0M0 - UM28D8000000005




(40VU)




(28VU)




ECAM

FUEL TRANSFER

# FUEL TANK SAFETY PROCEDURES (2)

## General

After three fuel tank explosions in recent decades, which caused 346 deaths, the U.S Department of Transportation, Federal Aviation Administration (FAA), started a new regulation to get better fuel tank safety.
This regulation is related to the prevention of ignition sources in fuel tanks of current type certificated aircraft. It requires a one-time fuel system safety and design review of the aircraft.

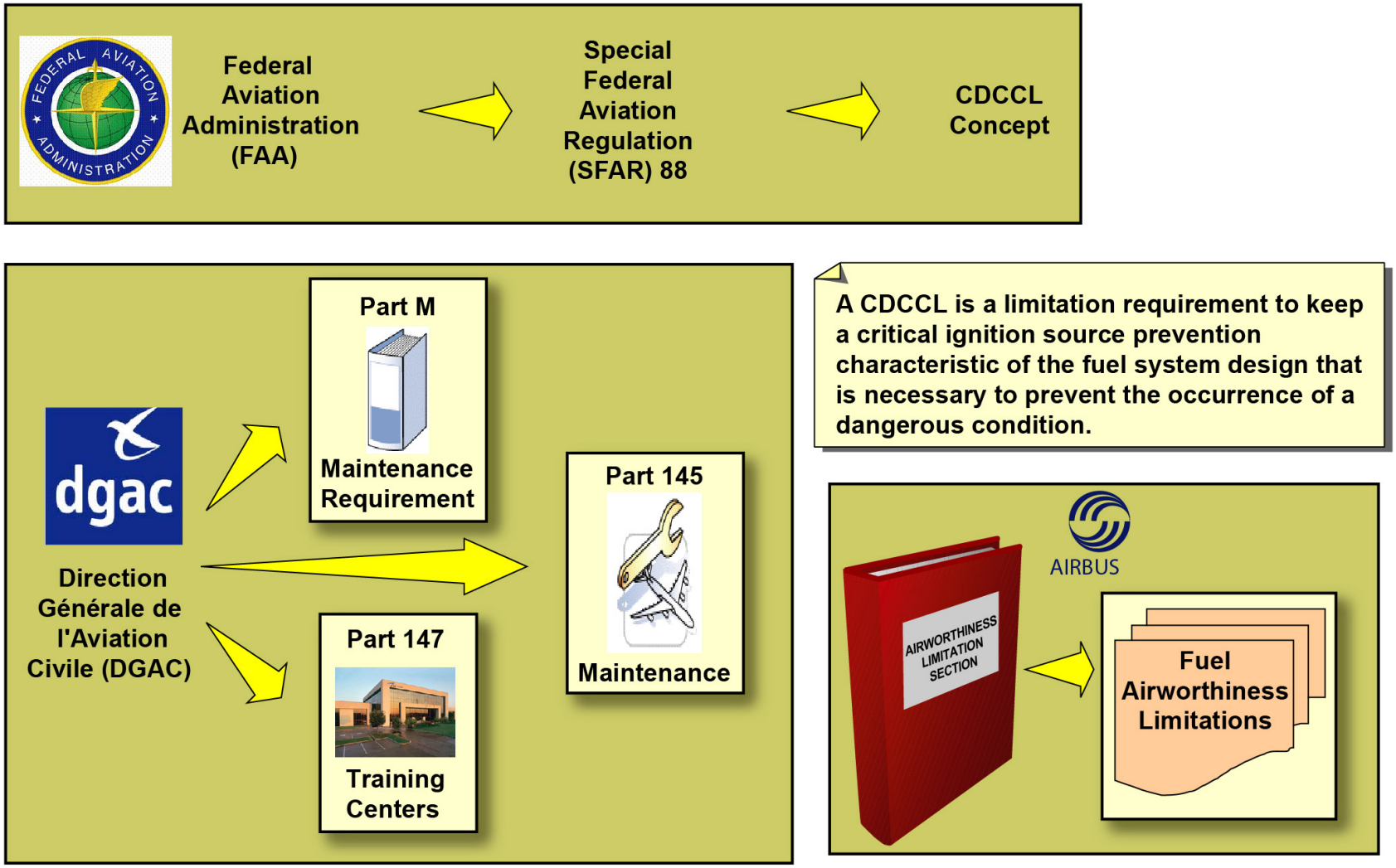
### Critical Design Configuration Control Limitations (CDCCL)

The FAA issued Special Federal Aviation Regulation (SFAR) 88 which gives a detailed description of the CDCCL concept.
The DGAC requested the SFAR 88 to be added to PART 145, PART M and PART 147 to reinforce the application of these regulations.
This includes:
- a conception part related to aircraft design characteristics,
- a maintenance part.

A CDCCL is a limitation requirement to keep a critical ignition source prevention characteristic of the fuel system design that is necessary to prevent the occurrence of a dangerous condition.
The function of the CDCCL is to give instructions to keep the critical ignition source prevention characteristic during a configuration change that can be caused by alterations, repairs or maintenance actions.
The aircraft manufacturers must supply a document to their customers that gives the list of all the maintenance tasks related to the CDCCL.
For AIRBUS, this document is called the Fuel Airworthiness Limitations and it is added to the Airworthiness Limitation Section part 5.

UGB13131 - U7ST0M0 - XM28D1000000001

## CRITICAL DESIGN CONFIGURATION CONTROL LIMITATIONS (CDCCL)


Federal Aviation Administration (FAA)
Special Federal Aviation Regulation (SFAR) 88
CDCCL Concept
Part M
Maintenance Requirement
dgac
Direction Générale de l'Aviation Civile (DGAC)
Part 145
Maintenance
Part 147
Training Centers
A CDCCL is a limitation requirement to keep a critical ignition source prevention characteristic of the fuel system design that is necessary to prevent the occurrence of a dangerous condition.
AIRBUS
AIRWORTHINESS LIMITATION SECTION
Fuel Airworthiness Limitations

GENERAL - CRITICAL DESIGN CONFIGURATION CONTROL LIMITATIONS (CDCCL)

# FUEL TANK SAFETY PROCEDURES (2)

## General (continued)

### Fuel Information and Combustion Triangle

A fuel tank can be viewed as a confined space where under specific conditions of pressure and temperature the ullage (vacant tank space) can be made of an evaporated fuel/air mixture known as fuel vapor.
The liquid fuel does not blow up on its own; explosive conditions are created when specific proportions of evaporated fuel, oxygen, pressure and temperature are present in the tank ullage; the fuel vapor is then defined as flammable. Even if the ullage is flammable, an explosion will not occur unless an ignition source of sufficient energy exists.
The combustion triangle:
An Explosion in a "Fuel" environment such as aircraft wing tanks can only occur if the 3 following sources are reached:
- fuel vapors,
- air (Oxygen O2),
- ignition (Electrical short cut, cigarette, etc.).

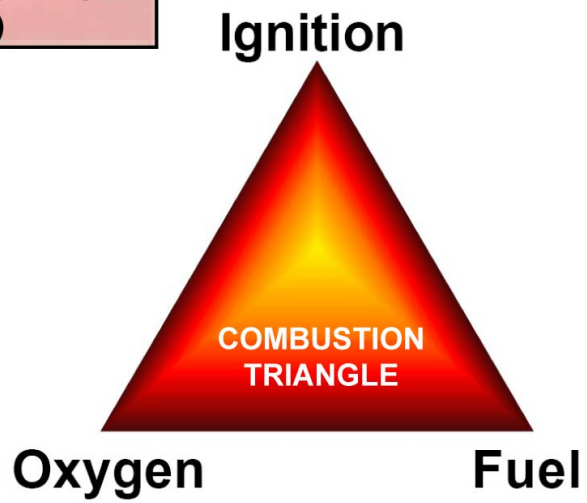
The aircraft fuel system has, by design, a number of features that are intended to protect the system from inadvertent ignition.
The potential sources of ignition considered are:
- spark generation inside a fuel tank by electrical current originated from external sources such as a lightning strike on the aircraft, by wiring or equipment electrical faults,
- spark/heat generation inside a fuel tank caused by friction of moving parts,
- fuel leakage outside of a fuel tank coming into contact with an ignition source.

A chart shows the fuel grades used.
The flash point is the lowest temperature at which the liquid supplies enough vapors mixed with ambient air, to make a gas that will ignite with the contact of a thermal source, also called flame.
At this temperature the combustion will not be self sufficient, because you need to reach the ignition point.
If the ignition does not need a flame, we talk about auto-ignition.
The Auto-Ignition point is the temperature at which a gas or a vapor ignites spontaneously in the absence of a thermal source.
Do not confuse this term with the ignition point (temperature at which the combustion is started and can continue).

| COUNTRY | ORGANISATION | GRADE DESIGNATION |
|---|---|---|
| — | IATA | KEROSENE |
| US | ASTM<br>DOD | JET A, JET A1<br>JP 8<br>JP 5 |
| UK | MOD | AVTUR<br>AVCAT<br>TS - 1, RT |
| CHINA | PRC MPIS | No. 3 JET FUEL<br>(RP 3) |

| JET A CARACTERISTICS | |
|---|---|
| Color | Colorless to yellow |
| Freeze temperature | < - 47°C |
| Density | From 0,775 to 0,840 |
| Flash point | Minimum 38°C at sea level<br>7°C at 12000 m |
| Self ignition temperature | >230°C |

**Flash point :**
**The flash point is the lowest temperature at which the liquid supplies enough vapors mixed with ambient air, to make a gas that will ignite with the contact of a thermal source (flame).**




**Auto-Ignition point :**
**the temperature at which a gas or a vapor ignites spontaneously in the absence of a thermal source.**

GENERAL - FUEL INFORMATION AND COMBUSTION TRIANGLE

# FUEL TANK SAFETY PROCEDURES (2)

## Fuel System Design Configuration

The Airbus aircraft fuel systems have, by design, a number of features that are intended to protect the system from inadvertent ignition.

- Wing / Trim Tank Structure:

In all the fuel tanks, the material and the large number of fasteners on the attachment of the metallic structure used make sure that the fuel tank structures are electrically bonded.

Composite ribs are bonded by means of metallic strips attached to the non-metallic structure.

All aluminum structural items in the wing, trim and centre boxes have a finishing for protection against electrical harnesses short-circuit with the structure.

The combination of the construction and thickness of the tank boundary skins give protection against a lightning strike causing ignition (heat).

- Fuel Quantity Indicating (FQI) Equipment:

Probes and sensors installed in tanks have low power supply. Electrical connection is done through a terminal block. The protective gap between the probes and the tank structure is maintained. They are electrically isolated from the structure.

- Fuel pump:

Fuel pumps have safety features to prevent pumps from working in an empty fuel tank. The pumps are tested to show that even after a long working condition in an "empty fuel tank" the rotating surfaces remain lubricated and thus limit the risk of mechanical ignition.

Each of the pumps is contained within an explosion-proof canister. It comprises a pump element contained within and electrically bonded to the canister and driven by an electric motor. Electrical connections to all pumps are made outside the tank.

The moving parts inside the pump are normally submerged in fuel so they cannot generate a spark during faulty conditions.

- Lightning Protection:

All equipment installed within any fuel tank is bonded to the structure

- Fuel System Wiring:

Only when absolutely necessary, wiring is routed inside fuel tanks. This wiring is limited to sensing and monitoring systems, with very low energy carrying requirements, to protect against the occurrence of an ignition source as a result of high energy entering the fuel tank via the wiring.

External electrical wiring support clamps make sure, that a cut cable cannot come into contact with the fuel tank boundary or structure in a fuel vapor area.

There is a complete segregation between in-tank wiring equipment and fuel calculators from other aircraft system wirings.

- Valves:

All motor operated valves within the fuel tanks have the actuator located outside the tank wall. The valve mechanisms inside the tank are dual bonded and do not have an ignition hazard.

- Pressure Switches:

Pump pressure switches are mounted on the tank boundaries. They are separated from the fuel by a diaphragm. The electrical connections are fully sealed and explosion proof.

- Fuel Leaks:

It is possible for fuel or fuel vapor to leak from a fuel tank into an adjacent area and the accumulated fuel can become hazardous causing ignition.

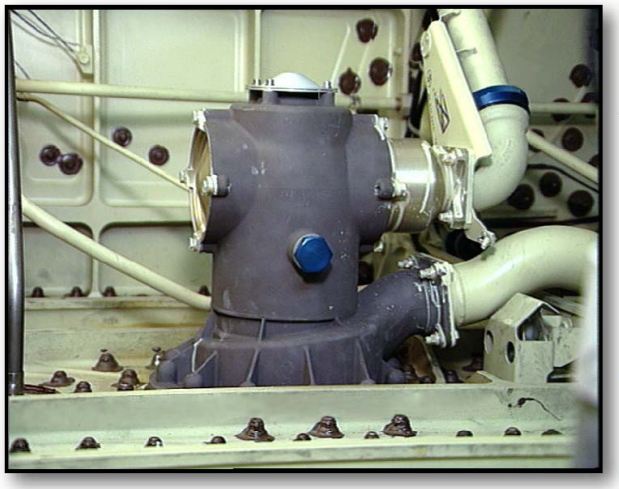
Fuel leaks from the wing and trim tanks go either to the leading or trailing edge cavities or to the outside. Any fuel overflowing from the NACA intake is directed downwards and away from the engines (heat source) via a fuel leak drip strip (angle section) located inboard of the NACA intake. In the leading and trailing edges the equipment is explosion proofed and insulated from the leakage. The APU fuel feed and Trim Tank transfer pipes at the rear fuselage are shrouded so any fuel leakage is drained overboard via the drain mast.

- Heat Sources:

Wing leading edges contain hot air ducting from the engines to the bleed air and anti icing systems. These pipes are insulated and separated from the tank boundary.

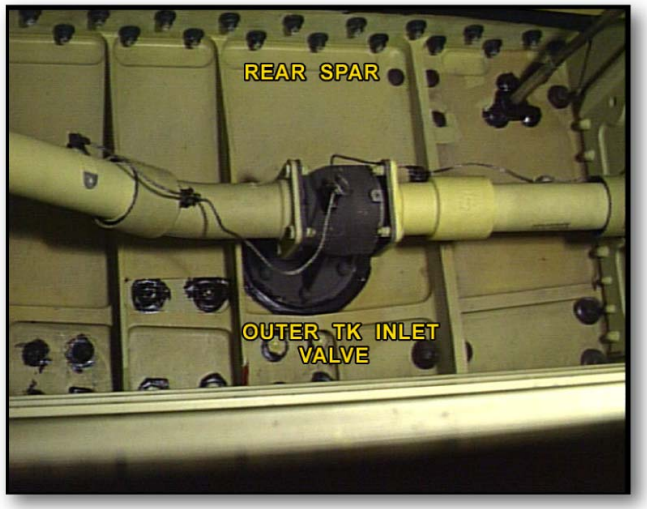
Electrical harnesses in the tanks use very low voltage current (less than 5 VDC) and are far enough for the surrounding equipment and structure (segregated routing).

Fuel pumps are the only electrical equipment using high power current (115 VAC). Consequently, pumps harnesses are located under the lower wing skin panels outside the fuel tanks.



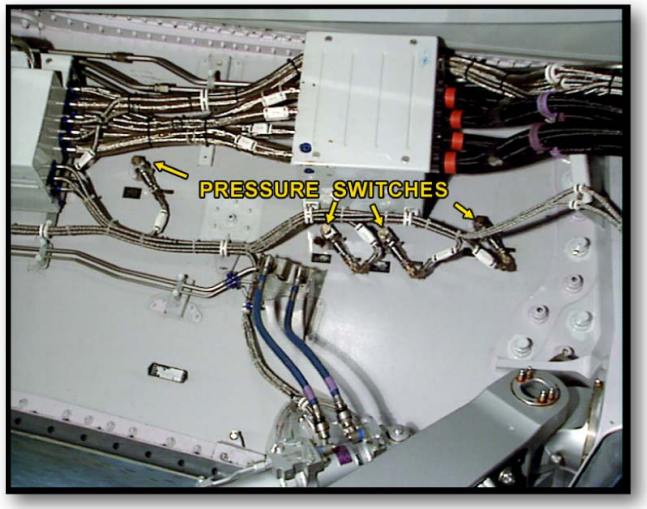
Fuel pumps are installed in a self-contained explosive canister.

FUEL SYSTEM DESIGN CONFIGURATION




Bonded valve inside the tank

Insulated hot air duct and Valve actuator located ouside of the tank




Pressure Switches and FQI terminal block

Wing fence and Naca air intake

FUEL SYSTEM DESIGN CONFIGURATION

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# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL

CDCCL items are listed in Airworthiness Limitation Form.
CDCCL section 2 of Airworthiness Limitation Form.

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AIRBUS

*Customer Services Directorate*

A330 Fuel Airworthiness Limitations

**SECTION 0 - INTRODUCTION**

**1. SCOPE**

This document contains the Fuel Airworthiness Limitations that arise from compliance with JAA's Interim Policy on Fuel Tank Safety (INT/POL/25/12) and FAA's Special Federal Aviation Regulation (SFAR) 88. They have been derived in accordance with JAA's draft Temporary Guidance Leaflet (TGL) 47 and FAA's Advisory Circular (AC) 25.981-1B. The nomenclature and means of promulgation follow the FAA's memorandum ref PS-ANM100-2004-10029 'Policy Statement on Process for Developing SFAR 88-related Instructions for Maintenance and Inspection of Fuel Tank Systems'. This latter document has been jointly developed between FAA and JAA to ensure a unified approach.

These requirements, together with the Life Limits / Monitored Parts, structural Airworthiness Limitation Items (ALI) and systems Certification Maintenance Requirements (CMR) comprise the Airworthiness Limitation Section which satisfies the requirements of JAR 25.1529 Appendix H paragraph 25.4.

IMPORTANT: At first delivery of an aircraft configuration into an operator's fleet, the requirements given in this document are mandatory, except in so far that interval escalations can be justified in accordance with the procedure stated herein. If a more restrictive Fuel ALI is issued on an aircraft configuration already in service, the requirement for existing operators to follow the revised FAL document will normally be mandated by Airworthiness Directive (Consigne de Navigabilité).

Non-compliance suspends the validity of the Airworthiness Certificate.

The identification of Fuel Airworthiness Limitations in no way diminishes the importance of other tasks and practices associated with the fuel system. Changes to these are subject to normal practices and procedures between the operator and his national authorities.

This document does not take into account Airworthiness Directives (Consigne de Navigabilité) which, if issued against an existing Fuel Airworthiness Limitation, supersede the specific requirement given in this document

MAINTENANCE APPLICATION OF CDCCL

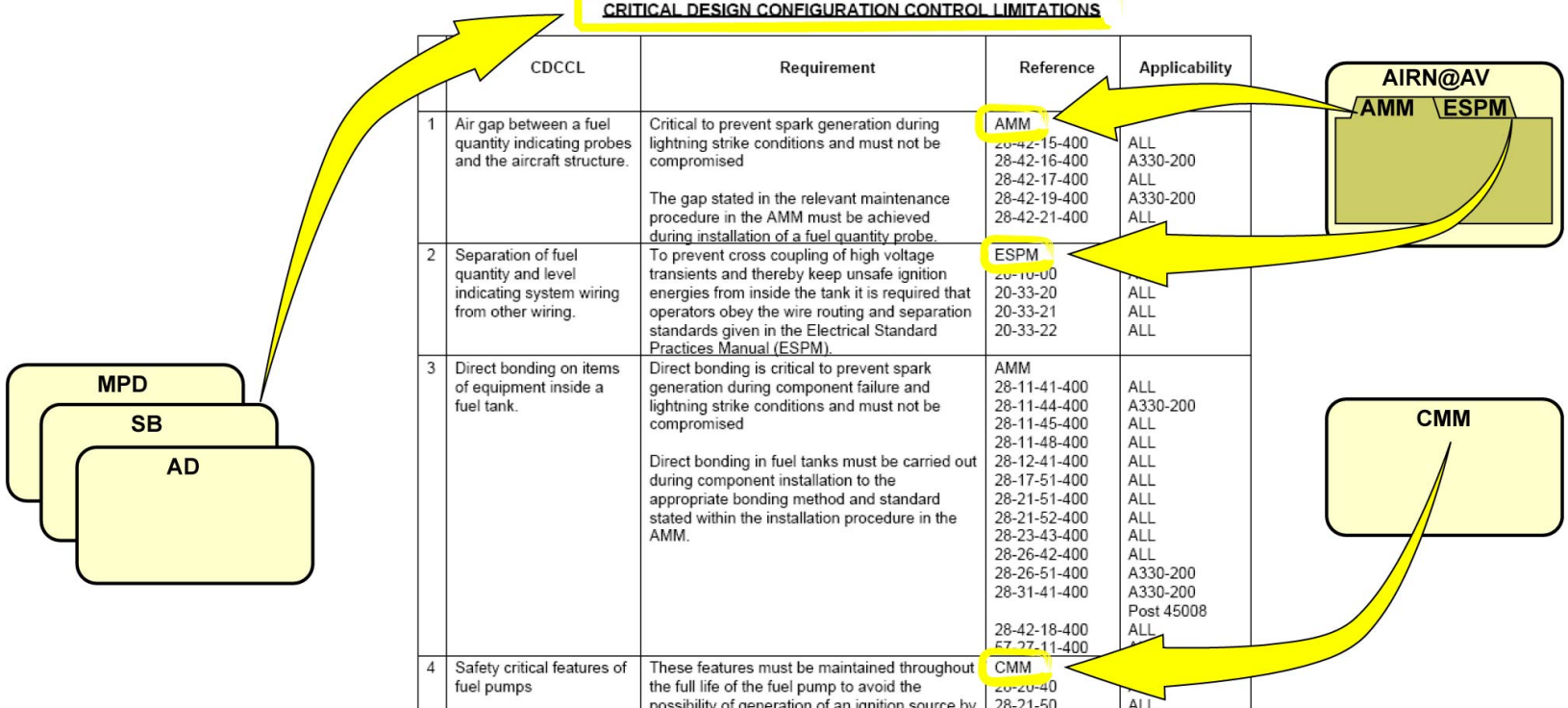
AIRBUS
*Customer Services Directorate*

A330 Fuel Airworthiness Limitations

**SECTION 2**

**CRITICAL DESIGN CONFIGURATION CONTROL LIMITATIONS**

| | CDCCL | Requirement | Reference | Applicability |
|---|---|---|---|---|
| 1 | Air gap between a fuel quantity indicating probes and the aircraft structure. | Critical to prevent spark generation during lightning strike conditions and must not be compromised<br><br>The gap stated in the relevant maintenance procedure in the AMM must be achieved during installation of a fuel quantity probe. | AMM<br>28-42-15-400<br>28-42-16-400<br>28-42-17-400<br>28-42-19-400<br>28-42-21-400 | <br>ALL<br>A330-200<br>ALL<br>A330-200<br>ALL |
| 2 | Separation of fuel quantity and level indicating system wiring from other wiring. | To prevent cross coupling of high voltage transients and thereby keep unsafe ignition energies from inside the tank it is required that operators obey the wire routing and separation standards given in the Electrical Standard Practices Manual (ESPM). | ESPM<br>20-10-00<br>20-33-20<br>20-33-21<br>20-33-22 | <br><br>ALL<br>ALL<br>ALL |
| 3 | Direct bonding on items of equipment inside a fuel tank. | Direct bonding is critical to prevent spark generation during component failure and lightning strike conditions and must not be compromised<br><br>Direct bonding in fuel tanks must be carried out during component installation to the appropriate bonding method and standard stated within the installation procedure in the AMM. | AMM<br>28-11-41-400<br>28-11-44-400<br>28-11-45-400<br>28-11-48-400<br>28-12-41-400<br>28-17-51-400<br>28-21-51-400<br>28-21-52-400<br>28-23-43-400<br>28-26-42-400<br>28-26-51-400<br>28-31-41-400<br><br>28-42-18-400<br>57-27-11-400 | <br>ALL<br>A330-200<br>ALL<br>ALL<br>ALL<br>ALL<br>ALL<br>ALL<br>ALL<br>ALL<br>A330-200<br>A330-200<br>Post 45008<br>ALL |
| 4 | Safety critical features of fuel pumps | These features must be maintained throughout the full life of the fuel pump to avoid the possibility of generation of an ignition source by overheating or sparks caused by arcing, friction etc.<br><br>Repair and overhaul of fuel pumps must be carried out in accordance with the equipment manufacturer's maintenance instructions or other maintenance instructions acceptable to the certifying authority. | CMM<br>28-20-40<br>28-21-50 | <br><br>ALL |




MAINTENANCE APPLICATION OF CDCCL

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# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL (continued)

### AMM Application

A WARNING in the procedures identifies CDCCL items. When a procedure identifies a CDCCL item, it is mandatory and necessary that you follow the instructions correctly and accurately.
Air gap between fuel quantity indicating probes and the aircraft structure.

WARNING: THIS PROCEDURE USES A FUEL SYSTEM ITEM THAT IS IN A CATEGORY KNOWN AS A CRITICAL DESIGN CONFIGURATION CONTROL LIMITATION (CDCCL). CDCCL IDENTIFIES AN ITEM THAT CAN BE THE SOURCE OF A POSSIBLE FUEL TANK IGNITION. YOU MUST KEEP ALL CDCCL ITEMS IN THE APPROVED CONFIGURATION. DAMAGE, WEAR OR CHANGES TO A CDCCL ITEM CAN CAUSE A POSSIBLE FUEL TANK EXPLOSION.

WARNING: THIS INSTRUCTION IS APPLICABLE TO A CRITICAL DESIGN CONFIGURATION CONTROL LIMITATION (CDCCL). CAREFULLY OBEY ALL GIVEN INSTRUCTIONS WHEN YOU DO THIS STEP. IF YOU DO NOT OBEY THESE INSTRUCTIONS, A DANGEROUS CONDITION CAN OCCUR THAT CAN CAUSE A POSSIBLE FUEL TANK EXPLOSION.

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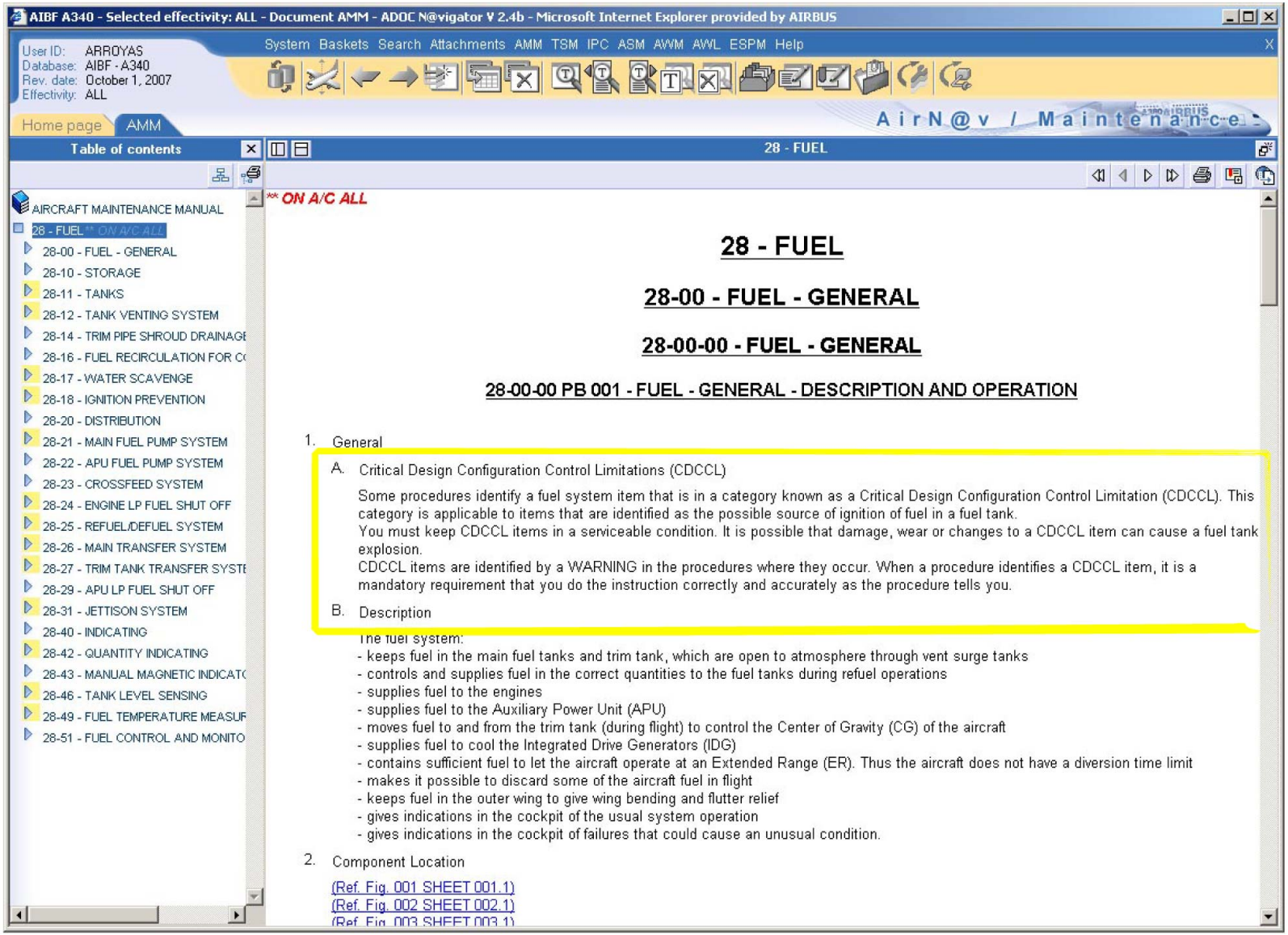
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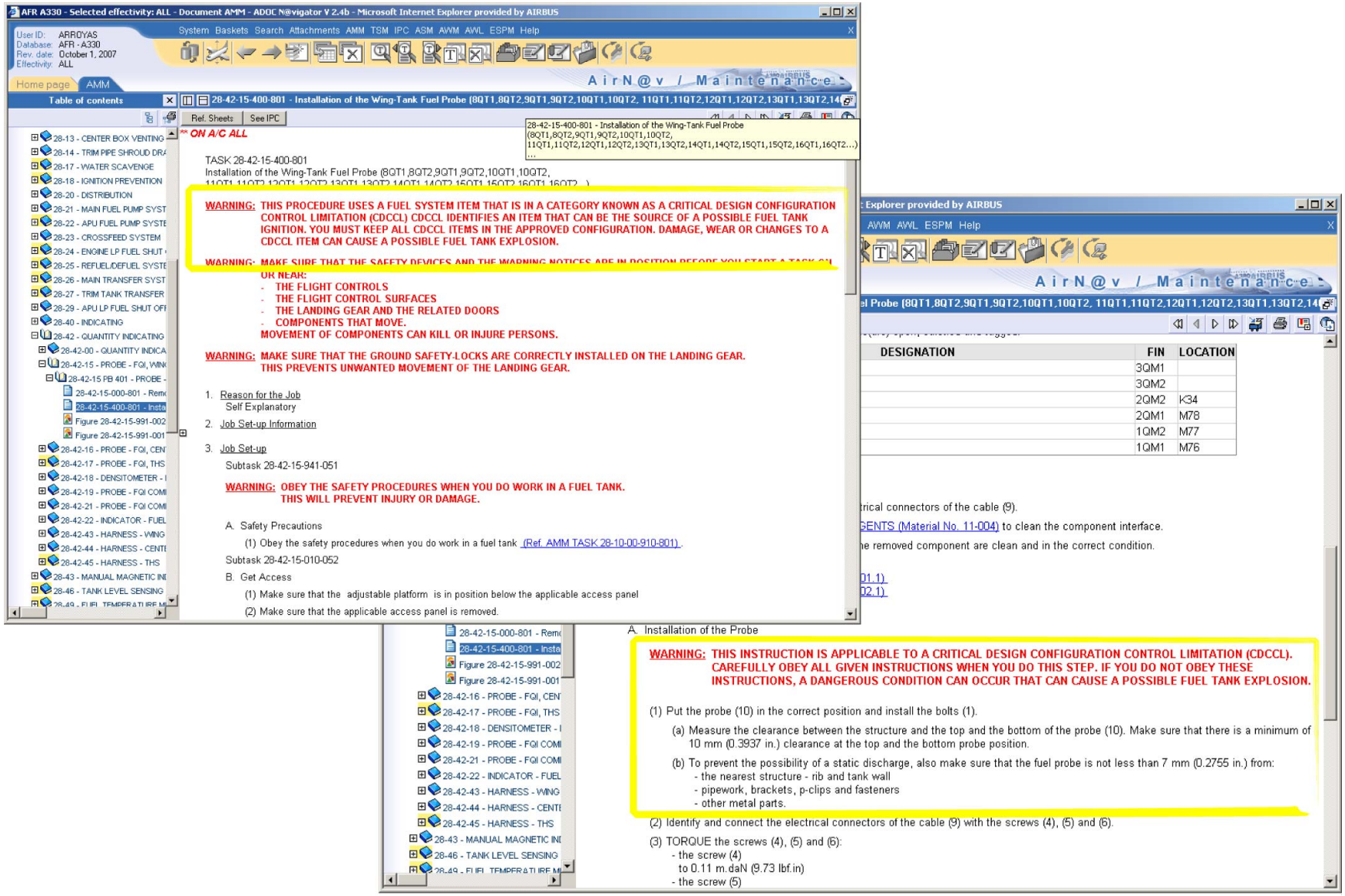
1. General
A. Critical Design Configuration Control Limitations (CDCCL)
Some procedures identify a fuel system item that is in a category known as a Critical Design Configuration Control Limitation (CDCCL). This category is applicable to items that are identified as the possible source of ignition of fuel in a fuel tank.
You must keep CDCCL items in a serviceable condition. It is possible that damage, wear or changes to a CDCCL item can cause a fuel tank explosion.
CDCCL items are identified by a WARNING in the procedures where they occur. When a procedure identifies a CDCCL item, it is a mandatory requirement that you do the instruction correctly and accurately as the procedure tells you.
B. Description
The fuel system:
- keeps fuel in the main fuel tanks and trim tank, which are open to atmosphere through vent surge tanks
- controls and supplies fuel in the correct quantities to the fuel tanks during refuel operations
- supplies fuel to the engines
- supplies fuel to the Auxiliary Power Unit (APU)
- moves fuel to and from the trim tank (during flight) to control the Center of Gravity (CG) of the aircraft
- supplies fuel to cool the Integrated Drive Generators (IDG)
- contains sufficient fuel to let the aircraft operate at an Extended Range (ER). Thus the aircraft does not have a diversion time limit
- makes it possible to discard some of the aircraft fuel in flight
- keeps fuel in the outer wing to give wing bending and flutter relief
- gives indications in the cockpit of the usual system operation
- gives indications in the cockpit of failures that could cause an unusual condition.
2. Component Location
(Ref. Fig. 001 SHEET 001.1)
(Ref. Fig. 002 SHEET 002.1)
(Ref. Fig. 003 SHEET 003.1)

MAINTENANCE APPLICATION OF CDCCL - AMM APPLICATION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28-42-15-400-801 - Installation of the Wing-Tank Fuel Probe
** ON A/C ALL
TASK 28-42-15-400-801
Installation of the Wing-Tank Fuel Probe (8QT1,8QT2,9QT1,9QT2,10QT1,10QT2,
WARNING: THIS PROCEDURE USES A FUEL SYSTEM ITEM THAT IS IN A CATEGORY KNOWN AS A CRITICAL DESIGN CONFIGURATION CONTROL LIMITATION (CDCCL) CDCCL IDENTIFIES AN ITEM THAT CAN BE THE SOURCE OF A POSSIBLE FUEL TANK IGNITION. YOU MUST KEEP ALL CDCCL ITEMS IN THE APPROVED CONFIGURATION. DAMAGE, WEAR OR CHANGES TO A CDCCL ITEM CAN CAUSE A POSSIBLE FUEL TANK EXPLOSION.
WARNING: MAKE SURE THAT THE SAFETY DEVICES AND THE WARNING NOTICES ARE IN POSITION BEFORE YOU START A TASK
OR NEAR:
- THE FLIGHT CONTROLS
- THE FLIGHT CONTROL SURFACES
- THE LANDING GEAR AND THE RELATED DOORS
- COMPONENTS THAT MOVE.
MOVEMENT OF COMPONENTS CAN KILL OR INJURE PERSONS.
WARNING: MAKE SURE THAT THE GROUND SAFETY-LOCKS ARE CORRECTLY INSTALLED ON THE LANDING GEAR. THIS PREVENTS UNWANTED MOVEMENT OF THE LANDING GEAR.
1. Reason for the Job
Self Explanatory
2. Job Set-up Information
3. Job Set-up
Subtask 28-42-15-941-051
WARNING: OBEY THE SAFETY PROCEDURES WHEN YOU DO WORK IN A FUEL TANK. THIS WILL PREVENT INJURY OR DAMAGE.
A. Safety Precautions
(1) Obey the safety procedures when you do work in a fuel tank (Ref. AMM TASK 28-10-00-910-801).
Subtask 28-42-15-010-052
B. Get Access
(1) Make sure that the adjustable platform is in position below the applicable access panel
(2) Make sure that the applicable access panel is removed.
DESIGNATION
FIN
LOCATION
3QM1
3QM2
2QM2 K34
2QM1 M78
1QM2 M77
1QM1 M76
A. Installation of the Probe
WARNING: THIS INSTRUCTION IS APPLICABLE TO A CRITICAL DESIGN CONFIGURATION CONTROL LIMITATION (CDCCL). CAREFULLY OBEY ALL GIVEN INSTRUCTIONS WHEN YOU DO THIS STEP. IF YOU DO NOT OBEY THESE INSTRUCTIONS, A DANGEROUS CONDITION CAN OCCUR THAT CAN CAUSE A POSSIBLE FUEL TANK EXPLOSION.
(1) Put the probe (10) in the correct position and install the bolts (1).
(a) Measure the clearance between the structure and the top and the bottom of the probe (10). Make sure that there is a minimum of 10 mm (0.3937 in.) clearance at the top and the bottom probe position.
(b) To prevent the possibility of a static discharge, also make sure that the fuel probe is not less than 7 mm (0.2755 in.) from:
- the nearest structure - rib and tank wall
- pipework, brackets, p-clips and fasteners
- other metal parts.
(2) Identify and connect the electrical connectors of the cable (9) with the screws (4), (5) and (6).
(3) TORQUE the screws (4), (5) and (6):
- the screw (4)
to 0.11 m.daN (9.73 lbf.in)
- the screw (5)

MAINTENANCE APPLICATION OF CDCCL - AMM APPLICATION

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# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL (continued)

### ESPM Application

Separation of fuel quantity and level indicating system wiring from other wiring.

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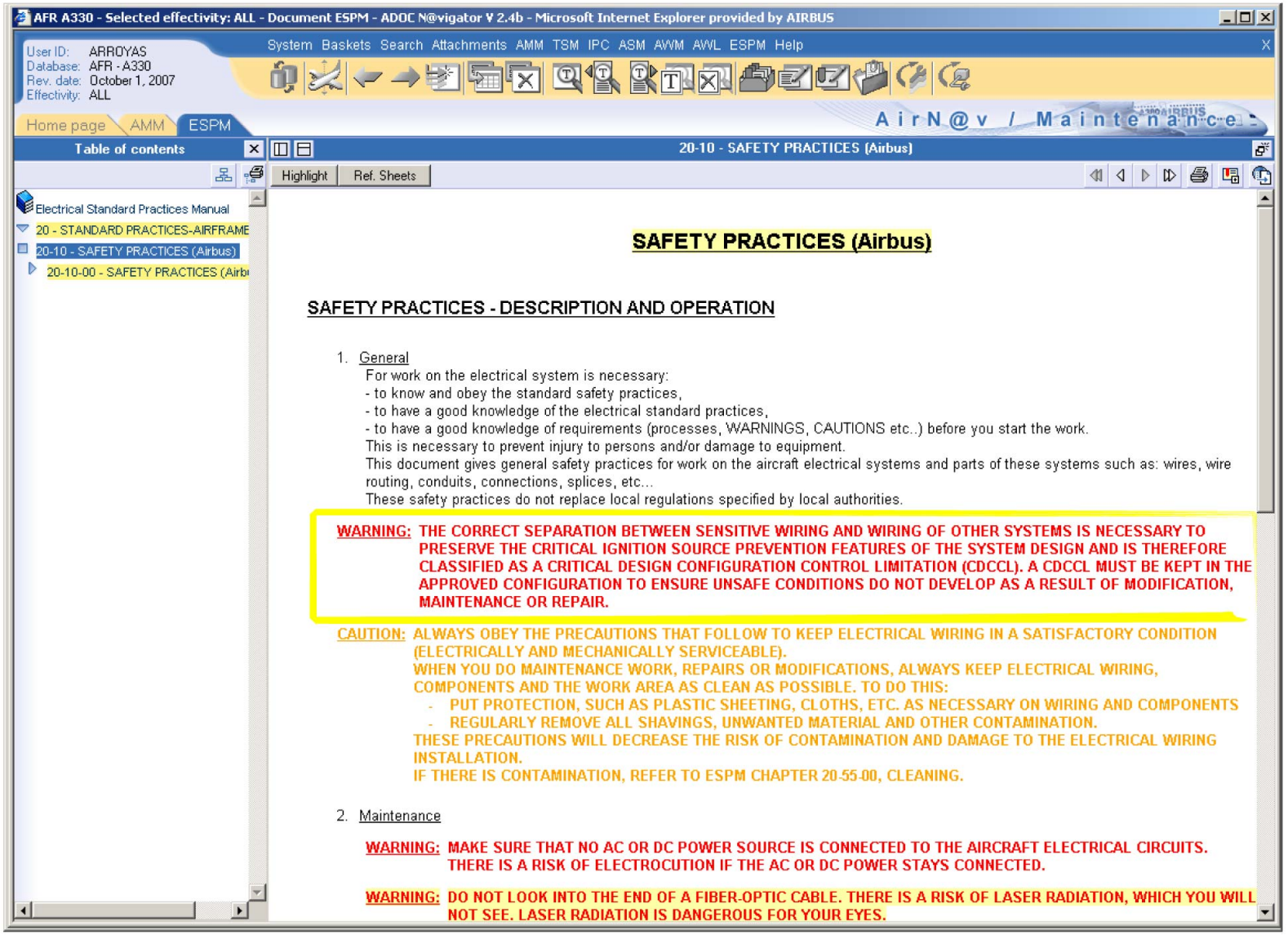
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20-10-00 - SAFETY PRACTICES (Airb
SAFETY PRACTICES (Airbus)
SAFETY PRACTICES - DESCRIPTION AND OPERATION
1. General
For work on the electrical system is necessary:
- to know and obey the standard safety practices,
- to have a good knowledge of the electrical standard practices,
- to have a good knowledge of requirements (processes, WARNINGS, CAUTIONS etc..) before you start the work.
This is necessary to prevent injury to persons and/or damage to equipment.
This document gives general safety practices for work on the aircraft electrical systems and parts of these systems such as: wires, wire routing, conduits, connections, splices, etc...
These safety practices do not replace local regulations specified by local authorities.
WARNING: THE CORRECT SEPARATION BETWEEN SENSITIVE WIRING AND WIRING OF OTHER SYSTEMS IS NECESSARY TO PRESERVE THE CRITICAL IGNITION SOURCE PREVENTION FEATURES OF THE SYSTEM DESIGN AND IS THEREFORE CLASSIFIED AS A CRITICAL DESIGN CONFIGURATION CONTROL LIMITATION (CDCCL). A CDCCL MUST BE KEPT IN THE APPROVED CONFIGURATION TO ENSURE UNSAFE CONDITIONS DO NOT DEVELOP AS A RESULT OF MODIFICATION, MAINTENANCE OR REPAIR.
CAUTION: ALWAYS OBEY THE PRECAUTIONS THAT FOLLOW TO KEEP ELECTRICAL WIRING IN A SATISFACTORY CONDITION (ELECTRICALLY AND MECHANICALLY SERVICEABLE).
WHEN YOU DO MAINTENANCE WORK, REPAIRS OR MODIFICATIONS, ALWAYS KEEP ELECTRICAL WIRING, COMPONENTS AND THE WORK AREA AS CLEAN AS POSSIBLE. TO DO THIS:
- PUT PROTECTION, SUCH AS PLASTIC SHEETING, CLOTHS, ETC. AS NECESSARY ON WIRING AND COMPONENTS
- REGULARLY REMOVE ALL SHAVINGS, UNWANTED MATERIAL AND OTHER CONTAMINATION.
THESE PRECAUTIONS WILL DECREASE THE RISK OF CONTAMINATION AND DAMAGE TO THE ELECTRICAL WIRING INSTALLATION.
IF THERE IS CONTAMINATION, REFER TO ESPM CHAPTER 20-55-00, CLEANING.
2. Maintenance
WARNING: MAKE SURE THAT NO AC OR DC POWER SOURCE IS CONNECTED TO THE AIRCRAFT ELECTRICAL CIRCUITS. THERE IS A RISK OF ELECTROCUTION IF THE AC OR DC POWER STAYS CONNECTED.
WARNING: DO NOT LOOK INTO THE END OF A FIBER-OPTIC CABLE. THERE IS A RISK OF LASER RADIATION, WHICH YOU WILL NOT SEE. LASER RADIATION IS DANGEROUS FOR YOUR EYES.

MAINTENANCE APPLICATION OF CDCCL - ESPM APPLICATION

# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL (continued)

### AMM Application

Direct bonding on items of an equipment inside a fuel tank.

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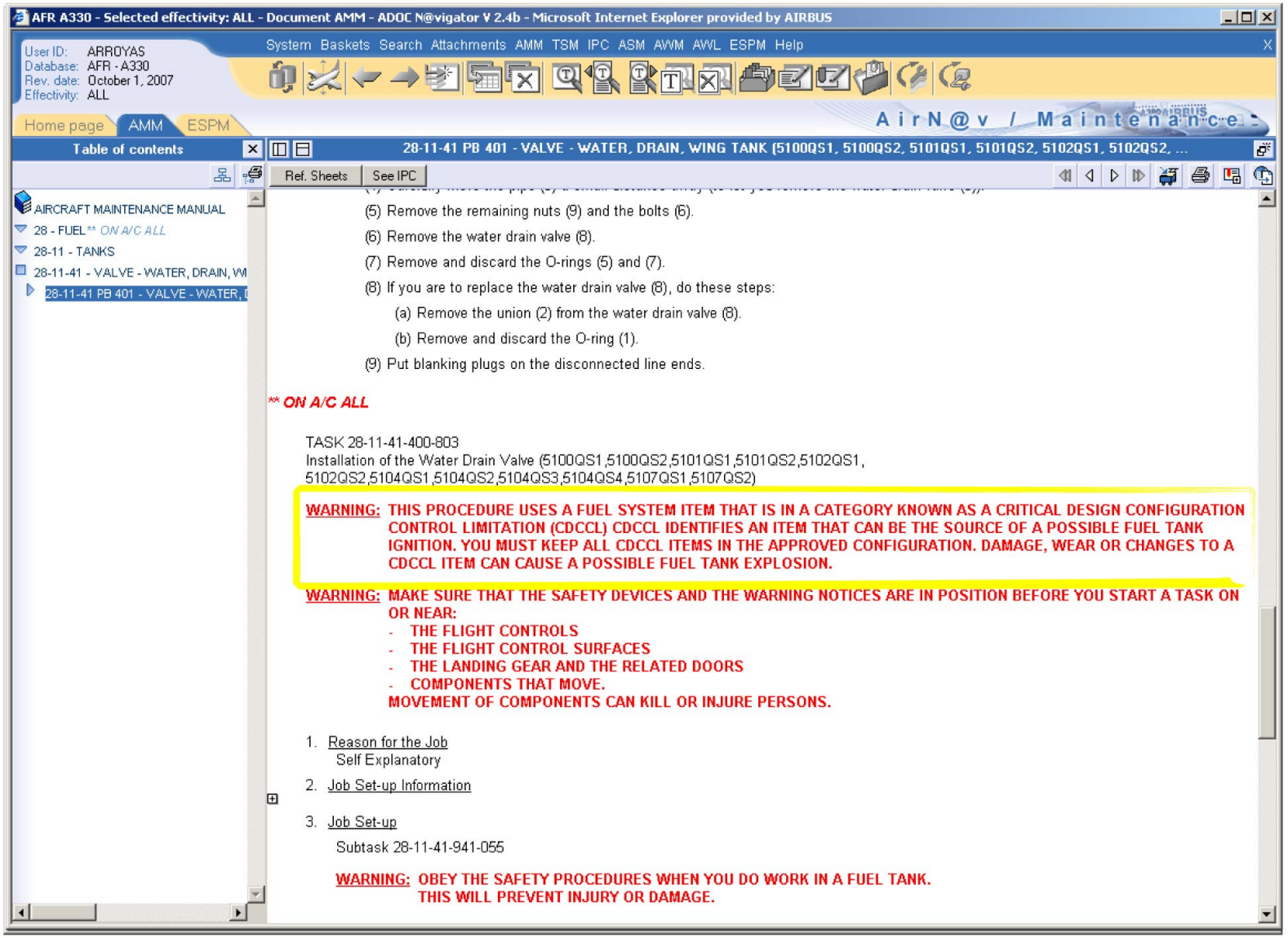
AFR A330 - Selected effectivity: ALL - Document AMM - ADOC N@vigator V 2.4b - Microsoft Internet Explorer provided by AIRBUS
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Database: AFR - A330
Rev. date: October 1, 2007
Effectivity: ALL
System Baskets Search Attachments AMM TSM IPC ASM AWM AWL ESPM Help
Home page AMM ESPM
AirN@v / Maintenance
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28-11-41 PB 401 - VALVE - WATER, DRAIN, WING TANK (5100QS1, 5100QS2, 5101QS1, 5101QS2, 5102QS1, 5102QS2, ...
Ref. Sheets See IPC
AIRCRAFT MAINTENANCE MANUAL
28 - FUEL** ON A/C ALL
28-11 - TANKS
28-11-41 - VALVE - WATER, DRAIN, WI
28-11-41 PB 401 - VALVE - WATER, D
(5) Remove the remaining nuts (9) and the bolts (6).
(6) Remove the water drain valve (8).
(7) Remove and discard the O-rings (5) and (7).
(8) If you are to replace the water drain valve (8), do these steps:
(a) Remove the union (2) from the water drain valve (8).
(b) Remove and discard the O-ring (1).
(9) Put blanking plugs on the disconnected line ends.
** ON A/C ALL
TASK 28-11-41-400-803
Installation of the Water Drain Valve (5100QS1,5100QS2,5101QS1,5101QS2,5102QS1, 5102QS2,5104QS1,5104QS2,5104QS3,5104QS4,5107QS1,5107QS2)
WARNING: THIS PROCEDURE USES A FUEL SYSTEM ITEM THAT IS IN A CATEGORY KNOWN AS A CRITICAL DESIGN CONFIGURATION CONTROL LIMITATION (CDCCL) CDCCL IDENTIFIES AN ITEM THAT CAN BE THE SOURCE OF A POSSIBLE FUEL TANK IGNITION. YOU MUST KEEP ALL CDCCL ITEMS IN THE APPROVED CONFIGURATION. DAMAGE, WEAR OR CHANGES TO A CDCCL ITEM CAN CAUSE A POSSIBLE FUEL TANK EXPLOSION.
WARNING: MAKE SURE THAT THE SAFETY DEVICES AND THE WARNING NOTICES ARE IN POSITION BEFORE YOU START A TASK ON OR NEAR:
- THE FLIGHT CONTROLS
- THE FLIGHT CONTROL SURFACES
- THE LANDING GEAR AND THE RELATED DOORS
- COMPONENTS THAT MOVE.
MOVEMENT OF COMPONENTS CAN KILL OR INJURE PERSONS.
1. Reason for the Job
Self Explanatory
2. Job Set-up Information
3. Job Set-up
Subtask 28-11-41-941-055
WARNING: OBEY THE SAFETY PROCEDURES WHEN YOU DO WORK IN A FUEL TANK. THIS WILL PREVENT INJURY OR DAMAGE.

MAINTENANCE APPLICATION OF CDCCL - AMM APPLICATION

# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL (continued)

### CMM Application

Safety critical features of fuel pumps: these features must be maintained throughout the full life of the fuel pump to avoid a possible ignition source by overheating or sparks caused by arcing, or friction etc...

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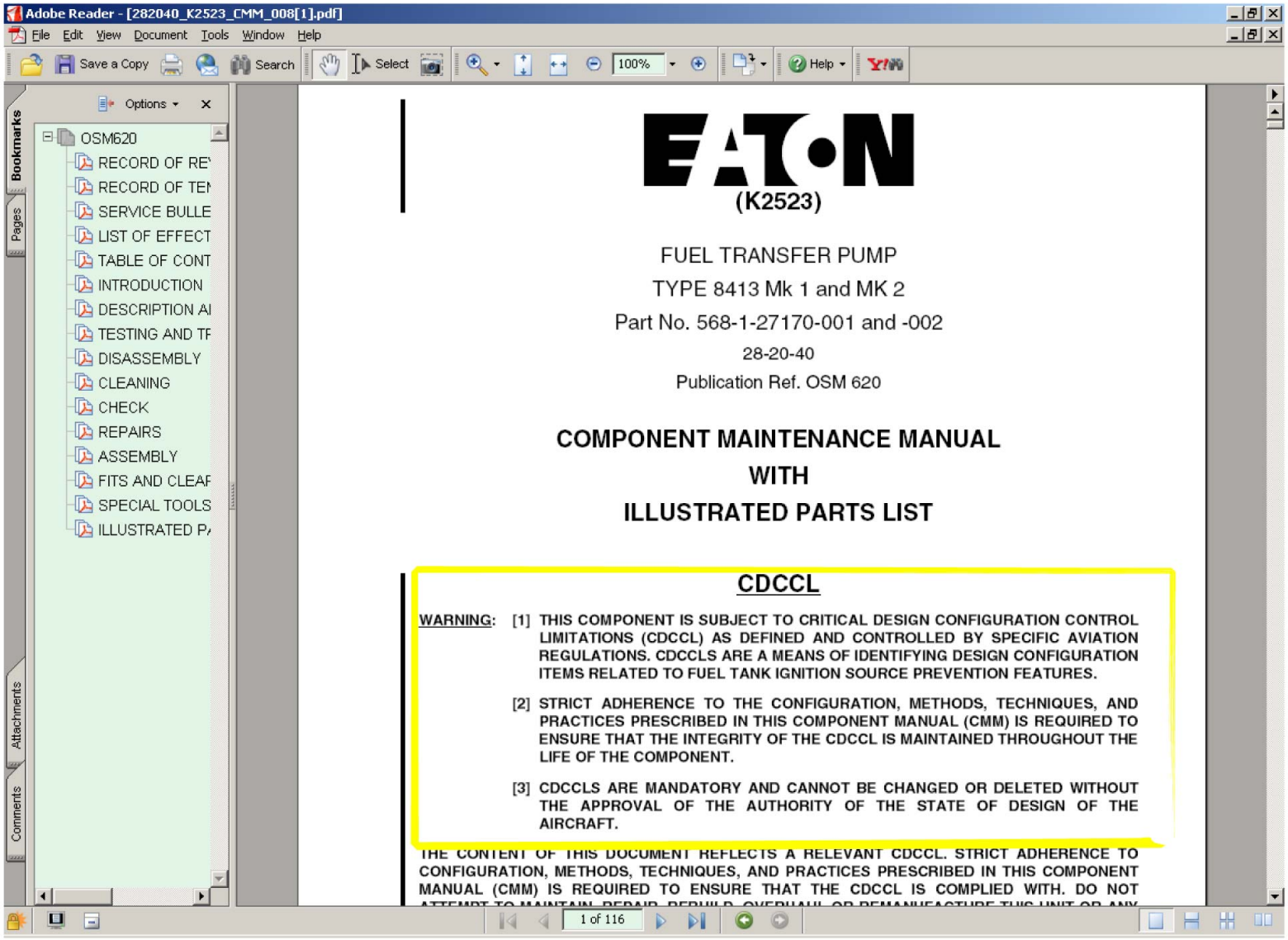
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Pages
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Comments
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SERVICE BULLE
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CLEANING
CHECK
REPAIRS
ASSEMBLY
FITS AND CLEAF
SPECIAL TOOLS
ILLUSTRATED P/
EATON
(K2523)
FUEL TRANSFER PUMP
TYPE 8413 Mk 1 and MK 2
Part No. 568-1-27170-001 and -002
28-20-40
Publication Ref. OSM 620
COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST
CDCCL
WARNING: [1] THIS COMPONENT IS SUBJECT TO CRITICAL DESIGN CONFIGURATION CONTROL LIMITATIONS (CDCCL) AS DEFINED AND CONTROLLED BY SPECIFIC AVIATION REGULATIONS. CDCCLS ARE A MEANS OF IDENTIFYING DESIGN CONFIGURATION ITEMS RELATED TO FUEL TANK IGNITION SOURCE PREVENTION FEATURES.
[2] STRICT ADHERENCE TO THE CONFIGURATION, METHODS, TECHNIQUES, AND PRACTICES PRESCRIBED IN THIS COMPONENT MANUAL (CMM) IS REQUIRED TO ENSURE THAT THE INTEGRITY OF THE CDCCL IS MAINTAINED THROUGHOUT THE LIFE OF THE COMPONENT.
[3] CDCCLS ARE MANDATORY AND CANNOT BE CHANGED OR DELETED WITHOUT THE APPROVAL OF THE AUTHORITY OF THE STATE OF DESIGN OF THE AIRCRAFT.
THE CONTENT OF THIS DOCUMENT REFLECTS A RELEVANT CDCCL. STRICT ADHERENCE TO CONFIGURATION, METHODS, TECHNIQUES, AND PRACTICES PRESCRIBED IN THIS COMPONENT MANUAL (CMM) IS REQUIRED TO ENSURE THAT THE CDCCL IS COMPLIED WITH. DO NOT
1 of 116

MAINTENANCE APPLICATION OF CDCCL - CMM APPLICATION

# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL (continued)

### MPD Application

Application in Maintenance Planning Document.

UGB13131 - U7ST0M0 - XM28D1000000001

A380 MAINTENANCE PLANNING DOCUMENT

| TASK NUMBER | ZONE | DESCRIPTION | THRESHOLD INTERVAL | SOURCE | REFERENCE | MEN | M/H | APPLICABILITY |
|---|---|---|---|---|---|---|---|---|
| 281400-00003-01 | 198 | PIPE SHROUD DRAINAGE AF OPC<br><br>CHECK DRAIN MAST/LEAK MONITOR FOR BLOCKAGE/OPERATION. | I: 12 MO | MRB 9 | 281400-210-801<br><br>MRB REFERENCE<br>281400-00003-01M | 1 | 0.10 | A380-800 |
| 281400-00004-01 | 140<br>310 | PIPE SHROUD DRAINAGE AF FNC<br><br>PRESSURE CHECK TRIM TRANSFER PIPE SHROUD FOR INTEGRITY.<br><br>ACCESS: 143AZ 197BB 198BB<br>311AB | I: 48 MO | MRB 8 | 281400-780-803<br><br>MRB REFERENCE<br>281400-00004-01M | 1<br>1<br><br>*<br>* | 0.60<br>0.60<br><br>0.91<br>0.02 | A380-800 |
| 281400-00005-01 | 140<br>310 | PIPE SHROUD DRAINAGE AF FNC<br><br>PRESSURE CHECK APU FUEL FEED PIPE SHROUD FOR INTEGRITY.<br><br>ACCESS: 143AZ 197BB 198BB<br>313AB | I: 48 MO | MRB 8 | 281400-780-804<br><br>MRB REFERENCE<br>281400-00005-01M | 1<br>1<br><br>*<br>* | 0.60<br>0.60<br><br>0.91<br>0.02 | A380-800 |
| 281400-00006-01 | 198 | PIPE SHROUD DRAINAGE AF OPC<br><br>CHECK LEAK MONITOR FOR CORRECT OPERATION. | I: 7 DY | MRB 9 | 281400-710-802<br><br>MRB REFERENCE<br>281400-00006-01M | 1 | 0.05 | A380-800 |
| 281800-00001-01 | 140<br>300<br>500<br>600 | IGNITION PREVENTION AF DET<br><br>DETAILED INSPECTION OF WING AND TRIM TANK BONDING LEADS.<br><br>ACCESS: 311AB | I: 144 MO | MRB 9 | 281800-220-801<br><br>MRB REFERENCE<br>281800-00001-01M | 1<br>1<br>1<br>1<br><br>* | 2.20<br>2.20<br>2.20<br>2.20<br><br>0.02 | A380-800 |
| 281800-00002-01 | 500<br>600 | IGNITION PREVENTION AF GVI<br><br>GENERAL VISUAL INSPECTION OF COMPOSITE RIB BONDING STRAPS.<br><br>ACCESS: 541AB 542DB 542EB 543AB 543BB 543CB<br>543DB 543EB 544AB 544BB 544CB 544DB<br><br>* * * * * C O N T I N U E D * * * * * | I: 144 MO | MRB 9 | 281800-210-803<br><br>MRB REFERENCE<br>281800-00002-01M | 1<br>1<br><br>* | 0.90<br>0.90<br><br>3.54 | A380-800 |

SYSTEMS AND POWER PLANT PROGRAM : FUEL ISSUE: JUN 01/07 SECTION: 2-28 PAGE 3

MAINTENANCE APPLICATION OF CDCCL - MPD APPLICATION

UGB13131 - U7ST0M0 - XM28D1000000001

# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL (continued)

### SB Application

Service bulletin applicable on single aisle family aircraft.

UGB13131 - U7ST0M0 - XM28D1000000001

## A318/A319/A320/A321

SERVICE BULLETIN
REVISION TRANSMITTAL SHEET

AIRBUS
CUSTOMER SERVICES DIRECTORATE
1 Rond Point Maurice Bellonte
31707 BLAGNAC CEDEX FRANCE
Tel : (33) 5 61 93 33 33
Telex : AIRBU 530526F
Fax : (33) 5 61 93 42 51

ATA SYSTEM : 33

TITLE : LIGHTS - CARGO AND SERVICE COMPARTMENTS - INSTALL MAINTENANCE LIGHT F1000955-01

MODIFICATION No. : 33593K9935

This page transmits Revision No. 01 of Service Bulletin No. A320-33-1044.

ADDITIONAL WORK

No additional work is required by this revision for aircraft modified by any previous issue.

REASON

This Revision is issued to :

- update the operators,

- update the Weight and Balance Information of Kit D01 and D02.

CHANGES

SUMMARY :

- REASON/DESCRIPTION/OPERATIONAL CONSEQUENCES

. Kit price changed from 1470 to 1560 USD.

- EFFECTIVITY

. Operators updated.

PLANNING INFORMATION :

- EFFECTIVITY

. 1.A. Operators updated.

- WEIGHT AND BALANCE

. 1.H. Weight and Balance updated.

- REFERENCES

. 1.J. AMM reference 33-37-00 added.

6 DATE : Mar 25/05 SERVICE BULLETIN No. : A320-33-1044

REVISION No. : 01 - Aug 22/05 Page : 1 of 2

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## A318/A319/A320/A321

SERVICE BULLETIN
SUMMARY

AIRBUS
CUSTOMER SERVICES DIRECTORATE
1 Rond Point Maurice Bellonte
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Tel : (33) 5 61 93 33 33
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This summary is for information only
and is not approved for modification of the aircraft

ATA SYSTEM : 33

TITLE : LIGHTS - CARGO AND SERVICE COMPARTMENTS - INSTALL MAINTENANCE LIGHT F1000955-01

MODIFICATION No. : 33593K9935

REASON/DESCRIPTION/OPERATIONAL CONSEQUENCES

The Special Federal Aviation Regulation (SFAR) 88 requests that the hydraulic area is protected against fuel vapour ignition. In order to fulfill the SFAR 88 requirements the maintenance lights 9LL and 10LL have been removed with Service Bulletin No. A320-92-1032.

This Service Bulletin details the procedure to replace maintenance lights 9LL and 10LL, PN 2LA002606-01, previously removed, with maintenance lights, PN F1000955-01.

The accomplishment of this Service Bulletin will fulfil the requirements of the SFAR 88 in maintenance areas.

| EVALUATION TABLE | | | |
|---|---|---|---|
| COMPLIANCE | Recommended | CANCELS INSPECTION SB | No |
| POTENTIAL AD | No | A/C OPERATION AFFECTED | No |
| RELIABILITY AFFECTED | No | PAX COMFORT AFFECTED | No |
| COST SAVING | No | ETOPS AFFECTED | No |
| STRUCTURAL LIFE EXTN | No | VENDOR SB INVOLVED | No |
| KIT PRICE (USD)D01 | 1560 | KIT PRICE (USD)D02 | 1560 |

EFFECTIVITY

This Service Bulletin is applicable to this (these) operator(s) :

30X 31X 53Z 57Y 72Y 83Y 88Y A1L AAF AAR ABQ ABY ACA ACI ADR AFL AFR AHY AJM ALK AMC AMU ANA ANZ ARF AUA AWE AZA BAW BES BGH BIE BMA BWG CBF CCM CES CIB CJG CNW CRX CSA CSC CSN CTN CXN CYP D2F DAT DCS DGA DKN DLH EDW EEZ EGN EIN EIR EZY F2I F2L FCA FFT FHY FIN G2X G4I G8E GBL GFA GWI GWY HDA HEJ HVN I2L IAC IBE IRM ISS IWD JBU JCS JET JKK JST KAC KYV LAJ LAN LAO LBT LTC LTE LTU LVG LXR MAU MEA MHS

6 DATE : Mar 25/05 SERVICE BULLETIN No. : A320-33-1044

REVISION No. : 01 - Aug 22/05 Page : 1 of 4

UGB13131 - U7ST0M0 - XM28D1000000001

MAINTENANCE APPLICATION OF CDCCL - SB APPLICATION

# FUEL TANK SAFETY PROCEDURES (2)

## Maintenance Application of CDCCL (continued)

### AD Application

Extract of the Airworthiness Directive.

UGB13131 - U7ST0M0 - XM28D1000000001

FAA
Aircraft Certification Service

**AIRWORTHINESS DIRECTIVE**

www.faa.gov/aircraft/safety/alerts/
www.gpoaccess.gov/fr/advanced.html

**2007-15-06 Airbus:** Amendment 39-15135. Docket No. FAA-2007-27268; Directorate Identifier 2006-NM-190-AD.

**Effective Date**

(a) This AD becomes effective August 28, 2007.

**Affected ADs**

(b) None.

...

**Revise ALS To Incorporate CDCCLs**

(g) Within 12 months after the effective date of this AD, revise the ALS of the Instructions for Continued Airworthiness to incorporate Airbus A318/A319/A320/A321 ALS Part 5–Fuel Airworthiness Limitations, dated February 28, 2006, as defined in Airbus A318/A319/A320/A321 Fuel Airworthiness Limitations, Document 95A.1931/05, Issue 1, dated December 19, 2005 (approved by the EASA on March 14, 2006), Section 2, "Critical Design Configuration Control Limitations."

**No Alternative Inspections, Inspection Intervals, or CDCCLs**

(h) Except as provided by paragraph (i) of this AD: After accomplishing the actions specified in paragraphs (f) and (g) of this AD, no alternative inspections, inspection intervals, or CDCCLs may be used.

...

MAINTENANCE APPLICATION OF CDCCL - AD APPLICATION

UGB13131 - U7ST0M0 - XM28D1000000001

# FUEL TANK SAFETY PROCEDURES (2)

## Safety Precautions

Make sure that you have the correct fire fighting equipment available.
When you have to work on a fuel system wiring, you must use test equipment that is approved (otherwise, unapproved equipment could cause fire or an explosion).
Make sure that the lighting in the work area is sufficient to work safely.
Wear protective goggles or face mask, clothes and gloves and avoid wearing metallic clothing (e.g. footwear or a belt with a metal buckle) which can cause sparks.
In the work area you must not:
- smoke,
- use flames which do not have protection,
- operate electrical equipment which is not necessary for the task,
- pull or move metal objects along the ground,
- use hearing-aids or battery-operated equipment which will cause sparks.

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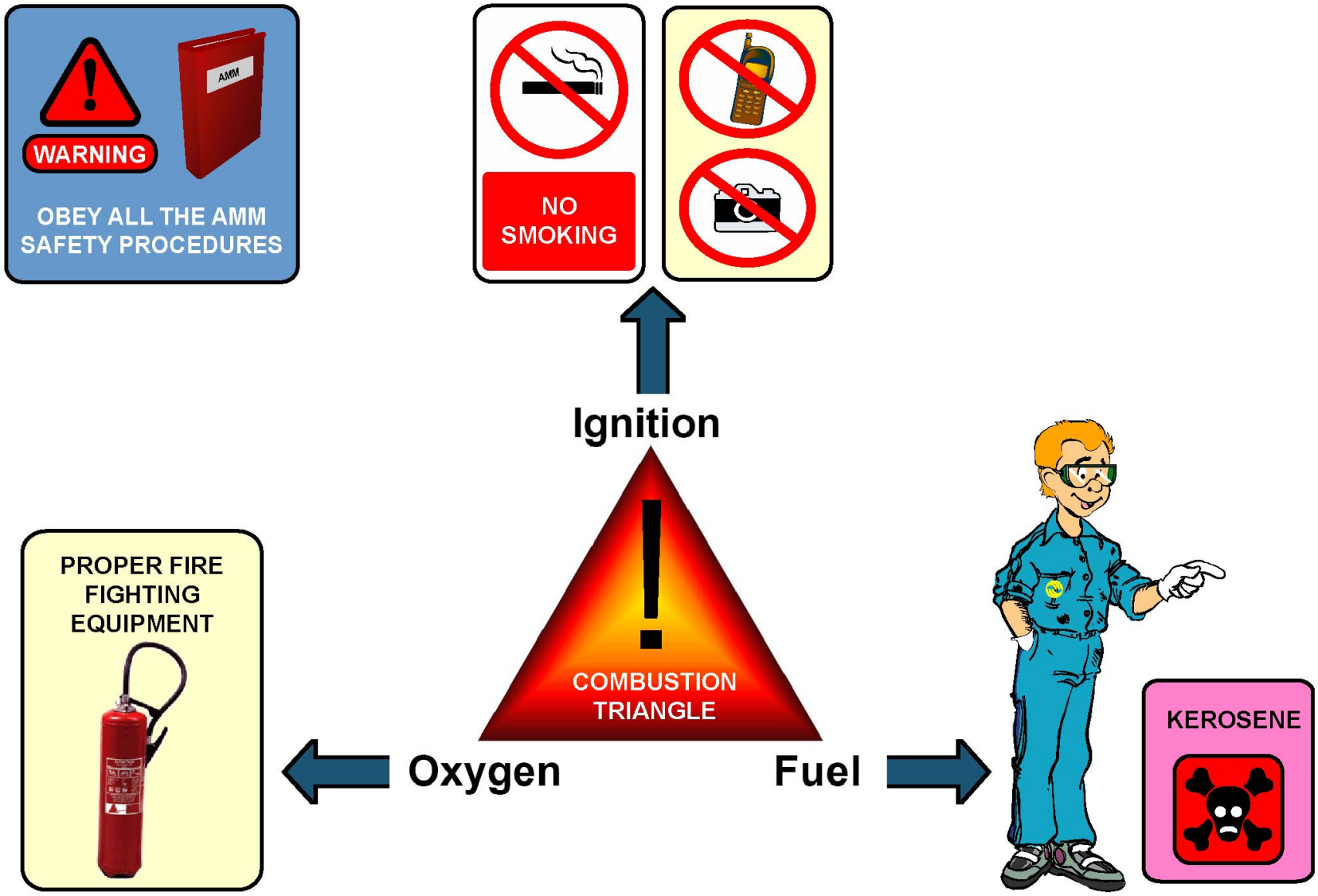



SAFETY PRECAUTIONS

# FUEL TANK SAFETY PROCEDURES (2)

## Safety Areas And Accessibility

Put the safety barriers in position and put the warning notices, to tell persons not to operate the fuel system, not to refuel the aircraft and not to operate the flaps.
Defuel the applicable wing tank or do a ground fuel transfer. Use the ECAM to make sure that the applicable fuel tank valves are closed and drain the remaining fuel
Open and safety tag circuit breakers for refuel system, refuel panel, applicable fuel valves and SFCC (Slat Flap Control Computers).
Open the related fuel tanks access panels.

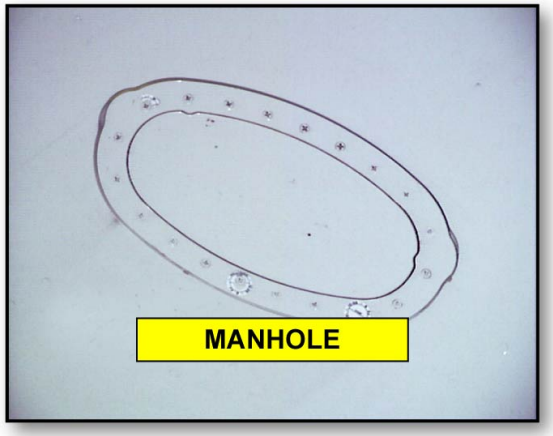
NOTE: Note: Some of these precautions are the minimum safety standard for work in a fuel tank. Local regulations can make other safety precautions necessary.

Safety barriers & warning notices must be in position prior to starting a task.

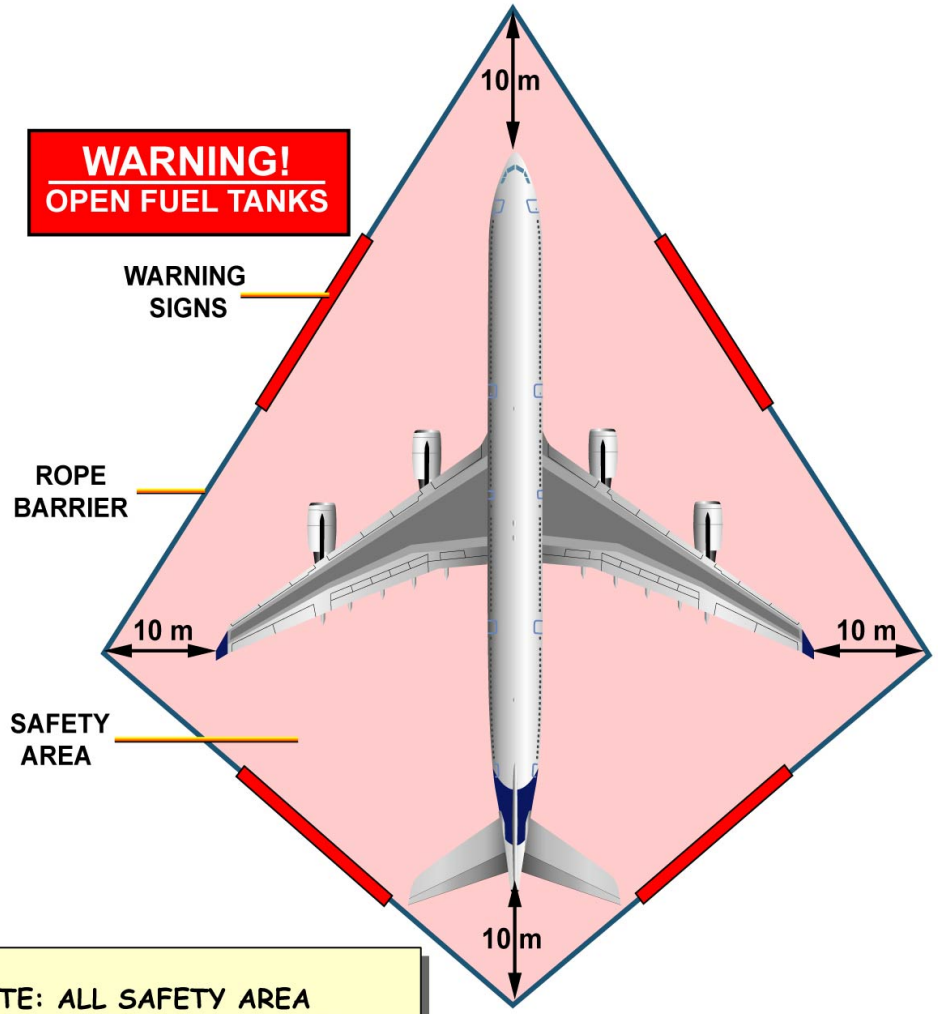
Do not operate the fuel system or the F/CTL (Slats & Flaps) or the L/G system : Movement of surrounding components can kill or injure people.

Defuel and drain the applicable wing tank.

Then open the fuel tank access panels :




EXAMPLE OF AN UNDER-WING FUEL TANK ACCESS PANEL (MANHOLE)




NOTE: ALL SAFETY AREA CLEARANCES ARE SUBJECT TO CHANGE ACCORDING TO LOCAL AIRPORT REGULATIONS.

SAFETY AREAS AND ACCESSIBILITY

# FUEL TANK SAFETY PROCEDURES (2)

## Tanks Ventilation

Vent the tanks with a proper venting system (fitted with minimum 1 air inlet & 1 air outlet).
Check with a combustible gas indicator (after minimum 6 hours of ventilation) the tanks fuel gas concentration.
The fuel gas concentration must be < 10% of the Lower Explosive Limit (LEL) before entering into the tanks.

WARNING: You must use a respirator if the fuel-gas concentration in the fuel tanks is more than 5% of the Lower Explosive Limit (LEL).

VENTING SYSTEM

Vent the tanks with a proper venting system (fitted with minimum 1 air inlet & 1 air outlet)

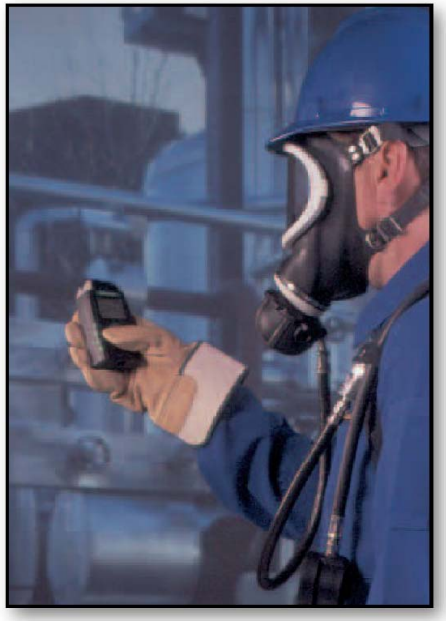
WARNING

KEEP THE VENTILATION AVAILABLE DURING THE COMPLETE WORK PROGRESS IN THE TANKS.

Check with a combustible gas indicator (after minimum 6 hours of ventilation) the tanks fuel gas concentration.

Fuel gas concentration must be < 10% of the Lower Explosive Limit (LEL) before entering into the tanks.

COMBUSTIBLE GAS INDICATOR



TANKS VENTILATION

# FUEL TANK SAFETY PROCEDURES (2)

## Entry Check-List

You must complete the Pre-Entry Checklist before you do work in a fuel tank.
Finally, get access to the applicable work area.

WARNING: S:
- do not touch or push against the magnetic level indicators when you are in the fuel tank. This will prevent damage to them.
- do not touch or push against the FQI probes when you are in the fuel tank. This will prevent damage to them and their installation.
- do not cause damage to the internal structure, sealant, electrical cables, or conduits during maintenance.

UGB13131 - U7ST0M0 - XM28D1000000001

Following the AMM Fuel Safety Procedures, maintenance personnel must fill in this PRE-ENTRY CHECK LIST before entering and working in the fuel tank.

**WARNING**

**WHEN ENTERING A FUEL TANK THROUGH A MANHOLE ACCESS PANEL, YOU MUST NOT HOLD ON SURROUNDING ELECTRICAL COMPONENTS LOCATED INSIDE THE TANKS.**

**EXTRACT OF AN A330 AMM FUEL TANK ENTRY CHECKLIST**

This check list must be complete before you do work in the fuel tank.

Wet Fuel Tank Entry Location

Aircraft:_____ Tank:_____ Shift:_____ Date:_____

Shift Supervisor is:_____

✓ the box when you have made sure that :-

1. All the aircraft electrical circuits are de-energized.
2. The aircraft is electrically grounded.
3. All the access platforms and associated equipment are electrically grounded.
4. All the electrical ground power units are disconnected.
5. Access to the area is limited and warning signs are in position.
6. A checklist of all tools and equipment to be used in the fuel tank is available.
7. Only approved spark-proof lamps and torches are in the work area. Sealed vapor-lamps are not to be used.
8. Only approved protective clothing is used.
9. The tank entry person and the safety person each have two air-supplied respirators that operate satisfactorily.
10. Both the tank entry person and the safety person have current medical certificates for entry into tanks.
11. Lint free cloths and special fire-proof containers are available to remove all remaining fuel.
12. There is a continuous flow of clean filtered air through the fuel tank available when the person is in the tank.
13. The vapor concentration is less than 25% of the applicable Lower Explosion Limit (LEL).
14. Correct fire fighting equipment and approved persons available.
15. The fire department has been told.

Meter Reading

16. Fuel-Gas concentration (LEL) reading prior to tank entry is:_____

I confirm that all entry requirements were met before entry was made into the tanks.

Signature of Supervisor Date/Time

Pre-Entry Checklist into a Wet Fuel Tank

ENTRY CHECK-LIST

UGB13131 - U7ST0M0 - XM28D1000000001

# FUEL TANK SAFETY PROCEDURES (2)

## Working Environment

NOTE: Note: You may have to remove parts of the structure (and equipment) to get access to parts of the tank.
Use protective mats on the floor of the fuel tank to prevent:
- damage to the fuel tank structure,
- injury to persons,
- safety all components before you place them inside the fuel tank,
- all wire locking must be installed/adjusted outside the fuel tank.

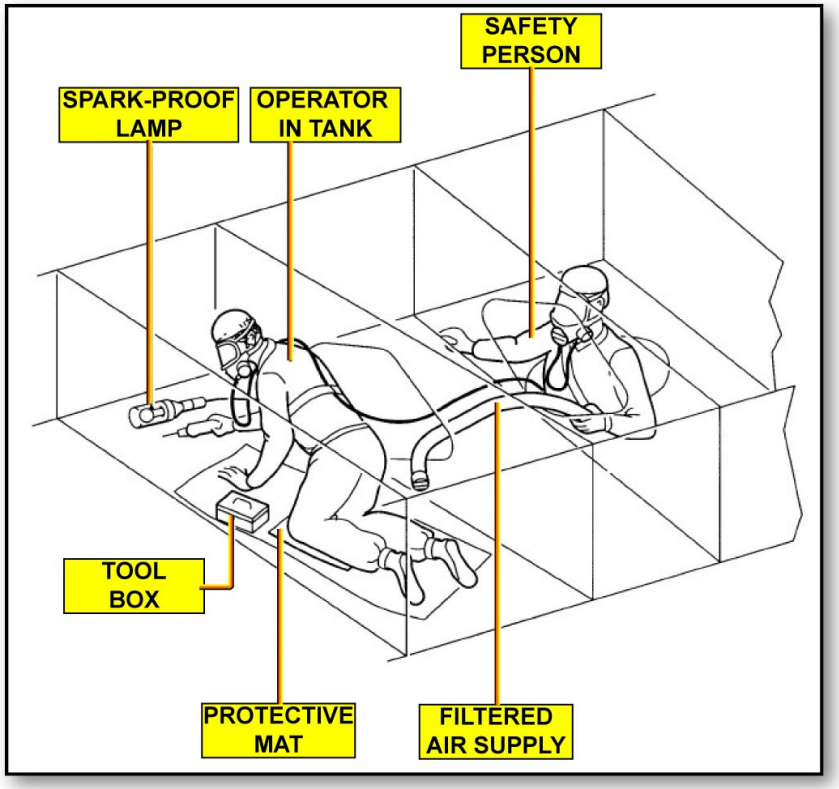
Use only RED tie wraps in the fuel tanks.
Use only approved cleaning materials.
Make sure that all signs of solvents and cleaning agents are removed from the equipment/components before they are installed.
Put blanking caps on all disconnected pipes and openings in components and tanks.
Do not connect electrical equipment to a power source less than 30 meters away, unless the power source has spark-proof connectors.
You must obey the fuel safety procedures when you do work in a fuel tank. When differences occur, you must use the approved precautions of this procedure.

WARNING: Do not use metallic wire wool in fuel tanks.

**WARNING**

OBEY THE SAFETY PROCEDURE WHEN YOU DO WORK IN A FUEL TANK. THIS WILL PREVENT INJURY OR DAMAGE.

Maintenance personnel working in fuel tanks must :
- work in team (safety person required)
- use proper lighting(e.g. spark proof lamp)
- use proper filtered air supply
- use protective mats on the floor to prevent damage to people and structure
- make sure that all the fuel system components have correct electrical bonding.
- record the removed parts and record the position of each panel bolt. This will prevent damage to the structure.




WORKING ENVIRONMENT

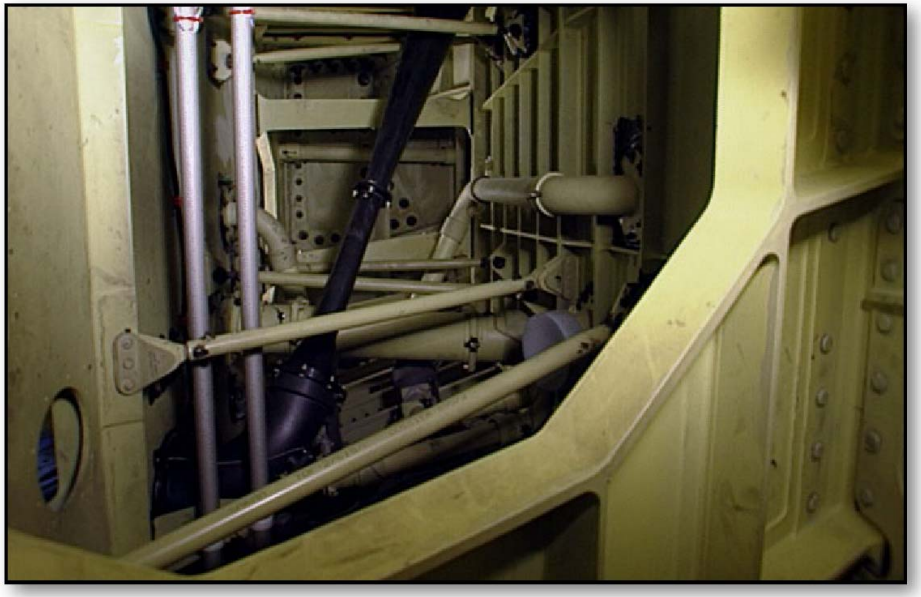
# FUEL TANK SAFETY PROCEDURES (2)

## Close-Up

After completion of a work in a fuel tank, personnel must make sure that:
- the work area is clear of tools,
- the work area is clean,
- no electrical equipment has been damaged and disconnected,
- all the fuel system components have a correct electrical bonding,
- all access panels are back in their original position (e.g. rib access panels).

UGB13131 - U7ST0M0 - XM28D1000000001

After completion of a work in a fuel tank, personnel must make sure that :
- the work area is clear of tools
- the work area is clean
- no electrical equipment has been damaged and disconnected
- all the fuel system components have a correct electrical bonding.
- all access panels are back in their original position (e.g. rib access panels)



EXAMPLE OF AN AIRBUS A330/A340 WING FUEL TANK (COLLECTOR CELL)

CLOSE-UP

# FUEL SYSTEM LINE MAINTENANCE (2)

## SERVICING

Automatic refueling is controlled by the Fuel Quantity Indicating Computer (FQIC) and may be performed with normal electrical power (External Ground Power or APU) or with battery power. With normal power established, opening the access panel will power up the refuel control panel automatically. To refuel on batteries, select BATT POWER to ON.

To start refueling in the automatic mode after the refuel panel is powered, follow these steps:

- perform the Lights (LTS) and High Level (HI. LVL) test. The high level test verifies the operation of the high-level protection system, which provides protection against overfilling and spillage.
- make sure that the REFUEL VALVE switches are in the NORM position
- set the Pre-selector to the required total fuel load
- set the MODE SELECT to REFUEL

There is no refuel valve indicator. The indication that the valve is open is an increase in the fuel quantity. When the refueling is complete, the END light will illuminate. The PRESELECTED and ACTUAL quantities should be equal (± 100 kg.).

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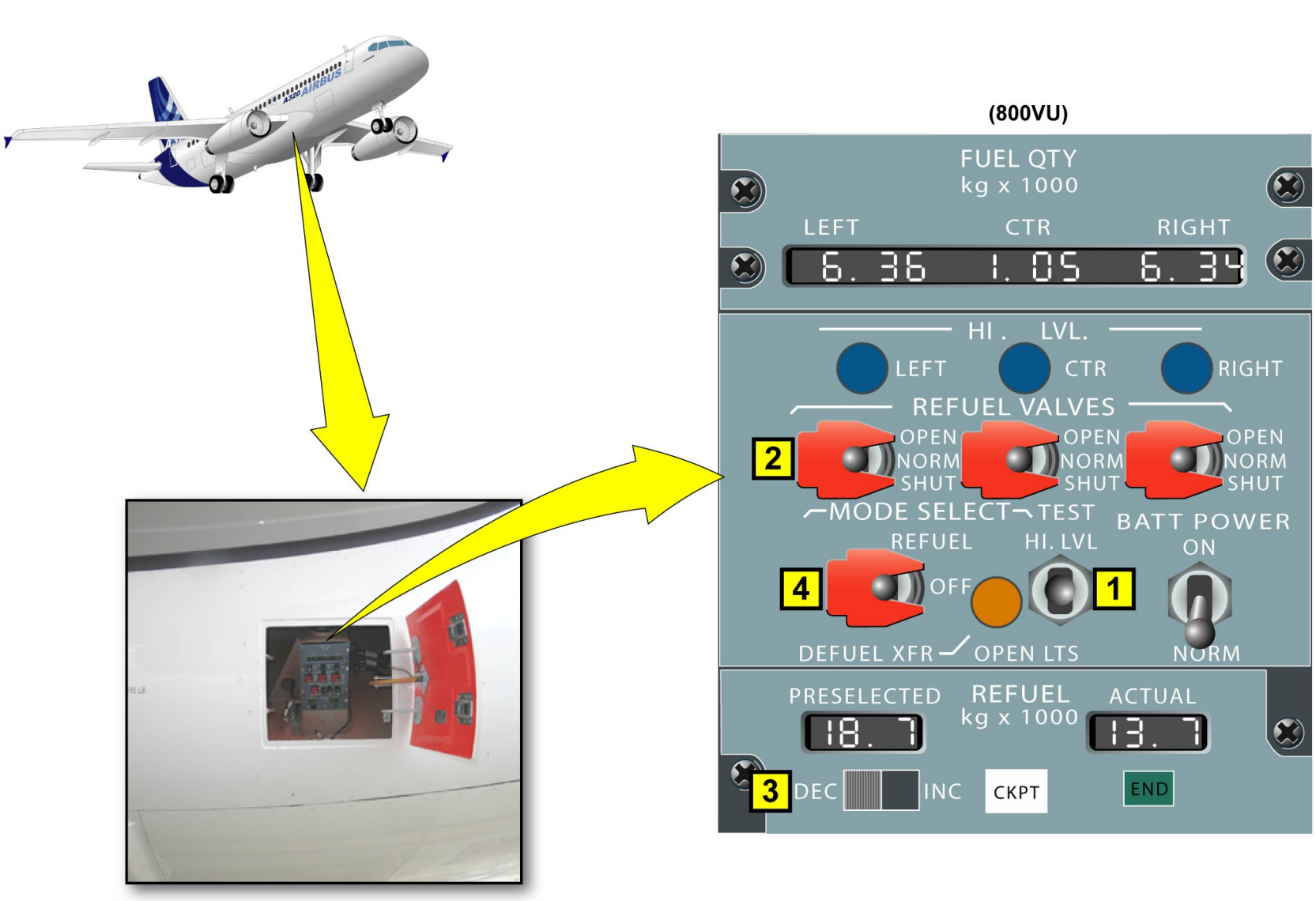

(800VU)
FUEL QTY
kg x 1000
LEFT
CTR
RIGHT
6.36
1.05
6.34
HI . LVL.
LEFT
CTR
RIGHT
REFUEL VALVES
2
OPEN
NORM
SHUT
OPEN
NORM
SHUT
OPEN
NORM
SHUT
MODE SELECT
TEST
BATT POWER
REFUEL
HI. LVL
ON
4
OFF
1
DEFUEL XFR
OPEN LTS
NORM
PRESELECTED
REFUEL
kg x 1000
ACTUAL
18.7
13.7
3
DEC
INC
CKPT
END

SERVICING

# FUEL SYSTEM LINE MAINTENANCE (2)

## DAILY CHECKS

Years of operational experience have shown that regular draining of the fuel tank water content will prevent many fuel system problems. The Maintenance Planning Document (MPD) recommends that operators perform this procedure every 36 hours (or less).

CAUTION: The following task summaries are presented for training only and are not supposed to be used to service an aircraft. Always use the current Aircraft Maintenance Manual (AMM) as the reference and adhere to ALL safety precautions.

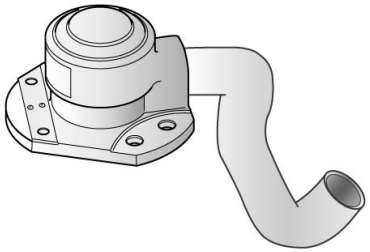
### DRAIN WATER CONTENT

All drains should be operated to insure proper water removal from the fuel. There are 2 drains in the center tank, 1 in each wing tank inner cell, 1 in each wing tank outer cell (A318/319/320 only) and 1 in each vent surge tank.
The remote inlet water drain valves in the wing cell or wing tank area have a remote inlet, with a short pipe connected to it, which goes to the lowest part of the fuel tank.
The water drain valves in the center tank and the vent surge tanks do not have a remote inlet. Thus they only drain their adjacent area.
If possible, the best time to drain the water from the tanks is prior to refueling. If that is not possible, wait one hour after refueling.
The center tank drain valves are found in the electric hydraulic pump compartments just forward of the wheel well in the belly fairing. The wing drain valves are accessible on the lower surface of the wing.
To operate the drain valves, use the PURGER tool and push up on the valve. Make sure to drain at least one liter of fuel for proper water removal. Adapting pipes are available for the PURGER tools to operate the wing drain valves from the ground. When draining is complete remove the PURGER tool and insure that there is no leakage at the drain valve. If the drain valve leaks, re-seat the valve by pushing up and releasing the drain valve.
The fuel removed may be tested for water content using a test kit.

## ENVIRONMENTAL PRECAUTIONS

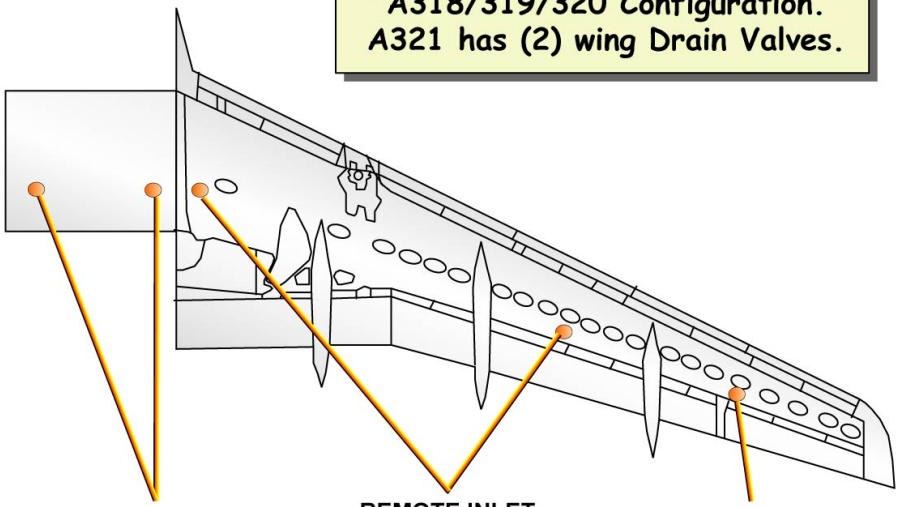
Do not discharge products such as oil, fuel, solvent, lubricant either in trash bins, soil or into the water network (drains, gutters, rain water, waste water, etc...).
Sort waste fluids and use specific waste disposal containers.
Each product must be stored in an appropriate and specific cabinet or room such as a fire-resistant and sealed cupboard.

TYPICAL WATER DRAIN VALVE



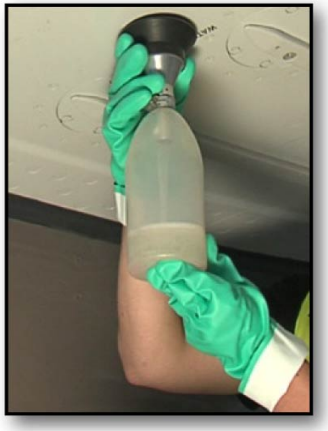
REMOTE INLET
WATER DRAIN VALVE

A318/319/320 Configuration.
A321 has (2) wing Drain Valves.

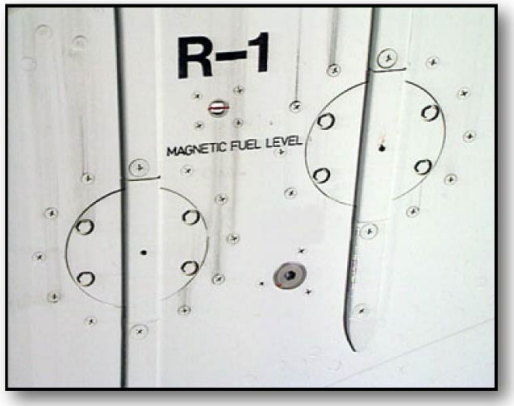



AVOID FLUID SPILLAGE
USE APPROPRIATE STORAGE EQUIPMENT FOR CHEMICAL PRODUCTS

CENTER TANK DRAIN VALVE ACCESS



PURGING TOOL




WING TANK DRAIN VALVE ACCESS

DAILY CHECKS - DRAIN WATER CONTENT & ENVIRONMENTAL PRECAUTIONS

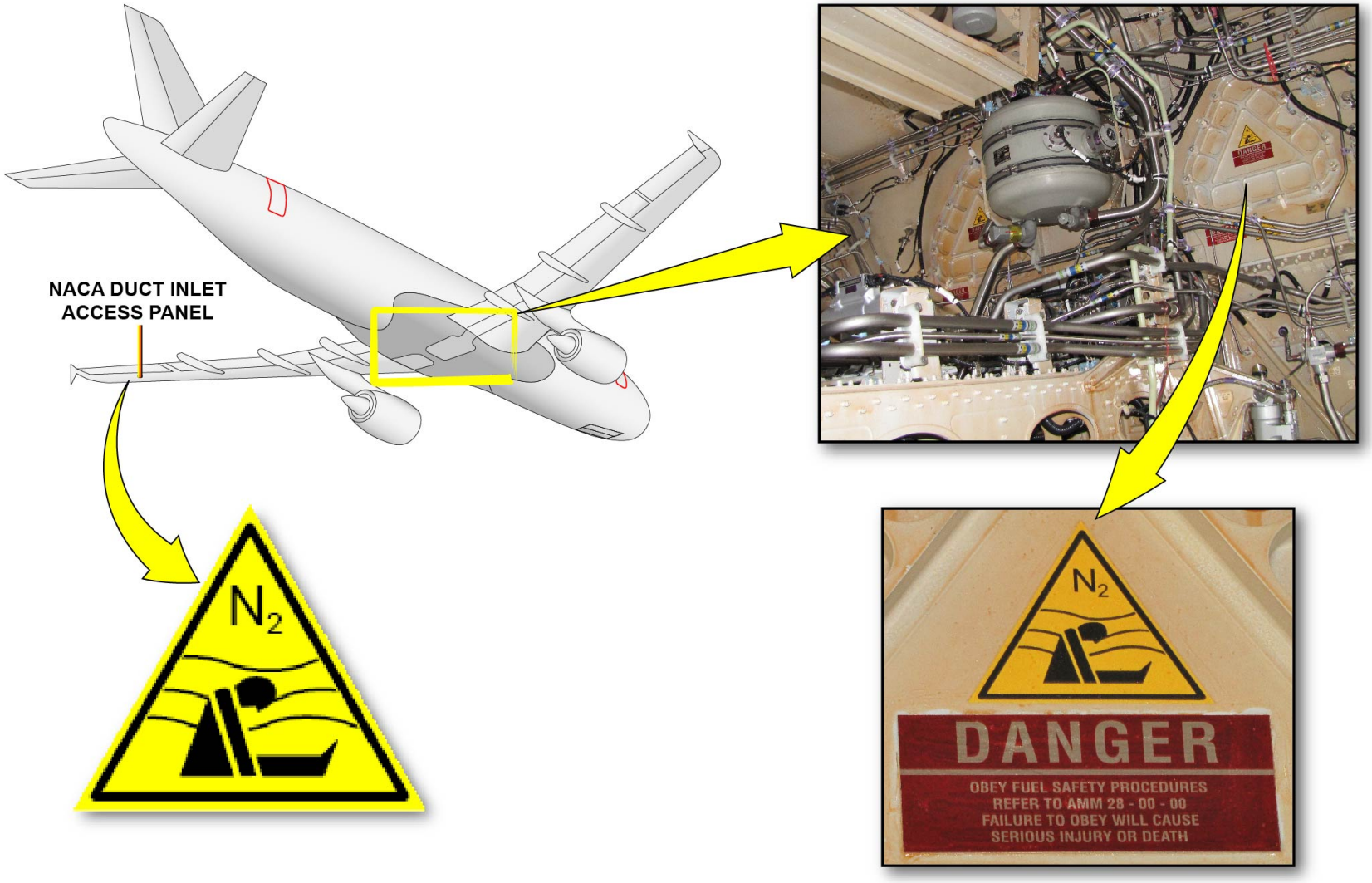
# FUEL SYSTEM LINE MAINTENANCE (2)

## DAILY CHECKS (continued)

### SAFETY PRECAUTIONS

The Fuel Tank Inerting System (FTIS) gives gases with low oxygen content, referred to as Nitrogen Enriched Air (NEA).
This NEA starts in the ullage space of the center tank and goes to the surge tank. There is a possible risk of asphyxiation in the left wing surge tank if you put your head through the NACA duct access panel and the center tank access panels. Placards are installed in these spaces to tell you of this risk.

UGB13131 - U7ST0M0 - UM28BA000000001




DAILY CHECKS - SAFETY PRECAUTIONS

# FUEL SYSTEM LINE MAINTENANCE (2)

## MEL/DEACTIVATION

This section will cover two procedures. The first procedure involves a failed refuel valve. The aircraft may be dispatched per MEL and refueling of the affected tank is accomplished by manual operation of the refuel valve.
The second procedure is the use of the Magnetic Level Indicators (MLI). The MLI's are used to check fuel quantity in the tanks in case of an indication malfunction or during refueling with no electrical power.

CAUTION: The following task summaries are only presented for training, and are not supposed to be used to service an aircraft. Always use the current Aircraft Maintenance Manual (AMM) as the reference and adhere to ALL safety precautions.

### MANUAL REFUEL VALVE OPERATION

During refueling, the refuel valve solenoid is energized and fuel pressure from the tanker/pump unit opens the valve. If the solenoid fails or if the electrical control of the solenoid fails, the valve may be operated manually by a plunger on the valve. There are 3 refuel valves on the aircraft. The center tank valve is located in the R/H wheel well on the forward wall (which is actually the center tank rear spar). The wing tank refuel valves are located on the left and right wing leading edge near the refuel coupling. The refuel/Defuel coupling shown is the optional one on the LH side.

NOTE: Remember: On the A318/A319/A320, during wing refueling all of the fuel goes to the outer cell and spills over into the inner cell, so only one refuel valve per wing is required.

To refuel a tank, PUSH and HOLD the manual plunger on the valve. The fuel pressure from the tanker/pump unit will open the valve. Be sure to monitor the fuel quantity carefully using the normal indication system or the MLI's if electrical power is not available (there will be slight reduction in tank capacity if the Intercell transfer valves are open - see AMM for tank quantities). When the desired quantity is reached, release the plunger to close the valve. The most important thing to remember is that there is NO High Level protection when operating the refuel valve with the manual plunger.

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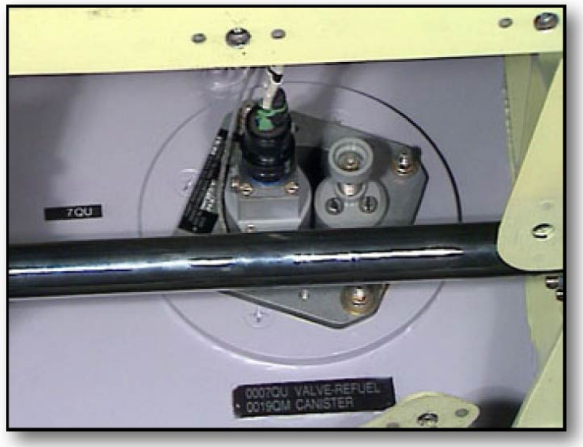
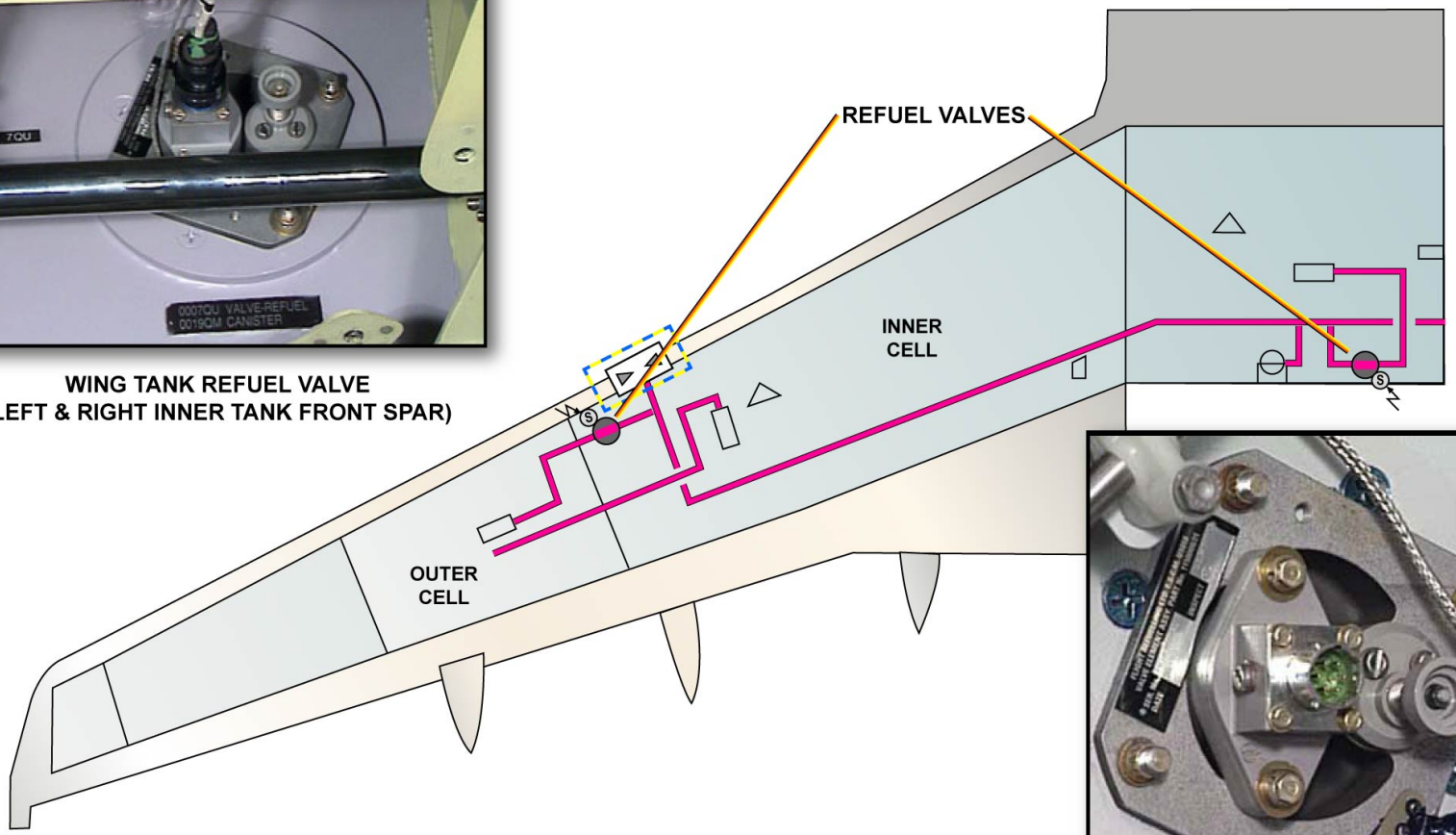
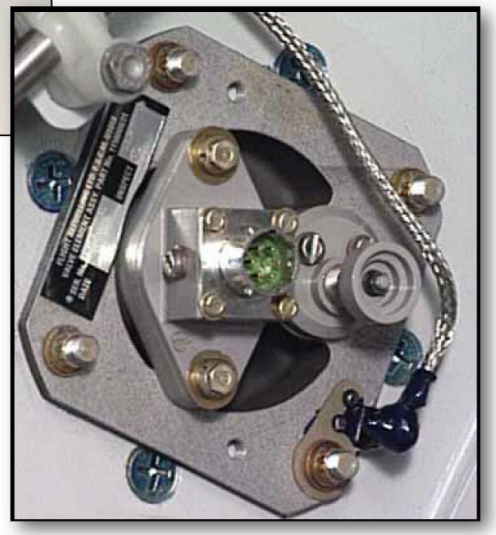



WING TANK REFUEL VALVE
(LEFT & RIGHT INNER TANK FRONT SPAR)



CENTER TANK REFUEL VALVE
(CENTER TANK REAR SPAR)

MEL/DEACTIVATION - MANUAL REFUEL VALVE OPERATION

# FUEL SYSTEM LINE MAINTENANCE (2)

## MEL/DEACTIVATION (continued)

### USE OF MAGNETIC LEVEL INDICATORS

Each fuel tank is equipped with one or more Magnetic Level Indicators (MLI's). In case of an indication malfunction or during refueling without electrical power available, the MLI's may be used to check fuel quantity. There is one MLI in the center tank, 4 in each wing tank on the A318/319/320 and 3 in each wing on the A321.
To use the MLI, extend the indicator rod and read the UNITS mark nearest to the bottom skin of the wing. Each tank is checked separately. The center and outer tanks have a single MLI each. This MLI is enough to determine the fuel volume in that tank. The wing tanks have multiple MLI's. To determine the wing volume, use the most outboard MLI, which indicates fuel in the tank. To check the total fuel quantity on the aircraft determine the total in each tank (CTR, INNER, OUTER) and add them together.

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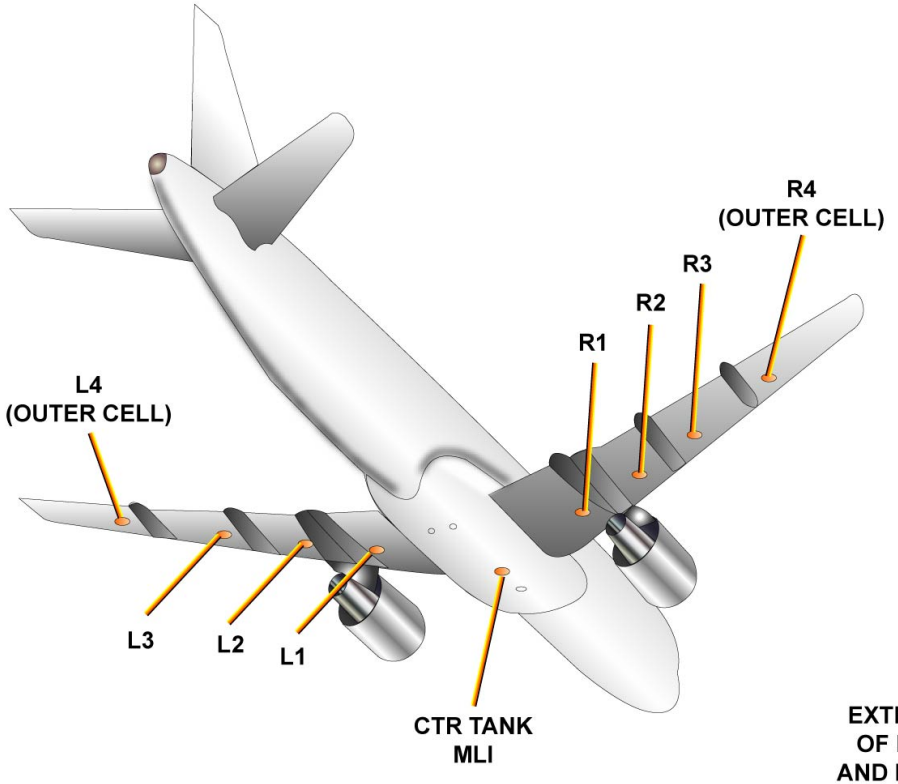
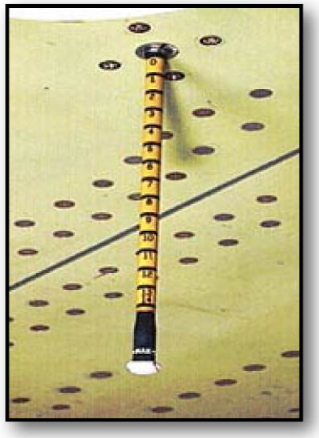
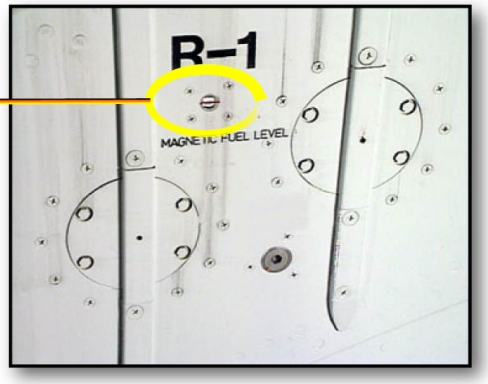


INDICATOR ROD
EXTENDED

EXTERNAL VIEW
OF RETRACTED
AND LOCKED MLI




A318/319/320 Configuration.
A321 has (3) wing MLI's.

MEL/DEACTIVATION - USE OF MAGNETIC LEVEL INDICATORS

# FUEL SYSTEM LINE MAINTENANCE (2)

## MEL/DEACTIVATION (continued)

### FUEL LEVEL MAGNETIC INDICATOR

In case of failure of the quantity indicating system the fuel Manual Magnetic Indicators (MMIs) must be used to monitor the quantity in the tanks. One MMI is installed in the center tank and five in each wing tank. Each MMI assembly is made of a MLI rod that can extend out of its MLI housing (listed in AMM by MLI reference, or Magnetic Level Indicator).

To measure the fuel quantity, the magnetic level indicator has to be unlocked. To accomplish this, use a screwdriver to push the applicable MLI rod and turn it through 90°. Hold and carefully lower the MLI rod fully. Then carefully lift the MLI rod until you feel the magnets. Read the units mark nearest to the bottom-skin of the wing and write down the number. Retract the MLI rod and use a screwdriver to turn through 90° the bayonet type lock.

The Magnetic Level indicators are a secondary direct reading gage to calculate the fuel in the Aircraft tanks, if the Fuel quantity indication system is unserviceable.

You must follow the fuel safety procedures when working with the fuel system.

Put the safety barriers in the position.

The density of the fuel is essential for calculating the mass of fuel in the aircraft tanks.

Take a fuel sample from the aircraft and measure its specific density.

On the A321, 3 magnetic level indicators are installed per wing, and one per center tank.

The A318, A319, A320 are equipped with 4 Magnetic level indicators per wing and one per center tank.

Put an access platform below the applicable MLI, start outboard.

Use a screwdriver to push the applicable MLI and turn it to 90° degrees.

Hold and lower the MLI fully.

Do not let them fall freely.

Carefully lift the MLI until you feel the magnet engaging.

Read and write down the value indicated on the MLI.

NOTE: The value on the MLI nearest to the wing bottom skin is the relevant one.

Insert and lock the MLI as soon as possible to avoid damage.

Aircraft attitude data is essential for fuel mass calculation.

Indication of pitch and roll data can be selected through the MCDU in the cockpit.

Data is provided by the air data inertial reference unit, or by the fuel quantity indication computer.

Refer to the table in the AMM to find the equivalent reference number and letter.

Use the applicable MLI stick number and the applicable aircraft attitude grid square letter to find the correct fuel quantity table in the AMM.

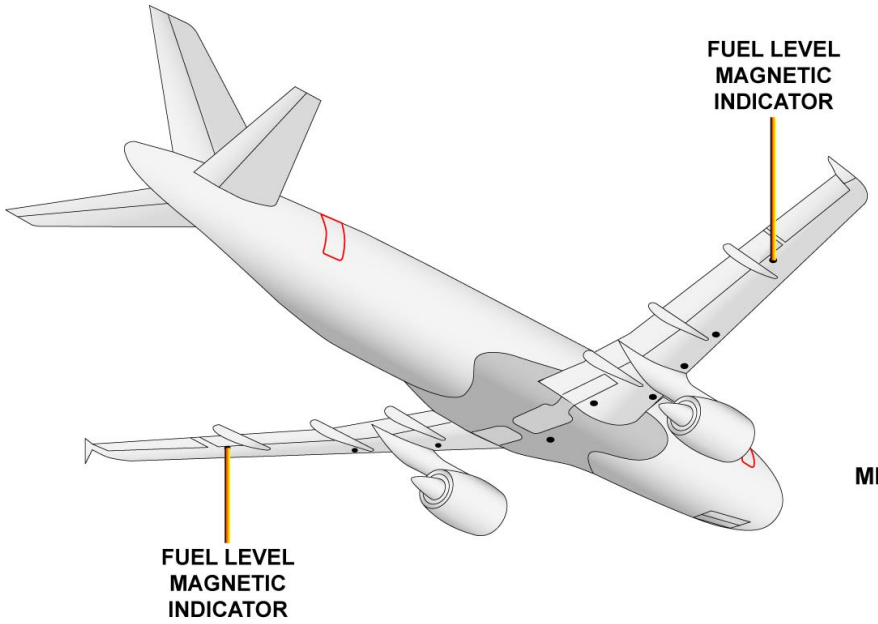
Find the applicable MLI units number row and the applicable aircraft attitude row in the AMM table.Determine the intersection of the applicable rows to give the correct volume in the tank.

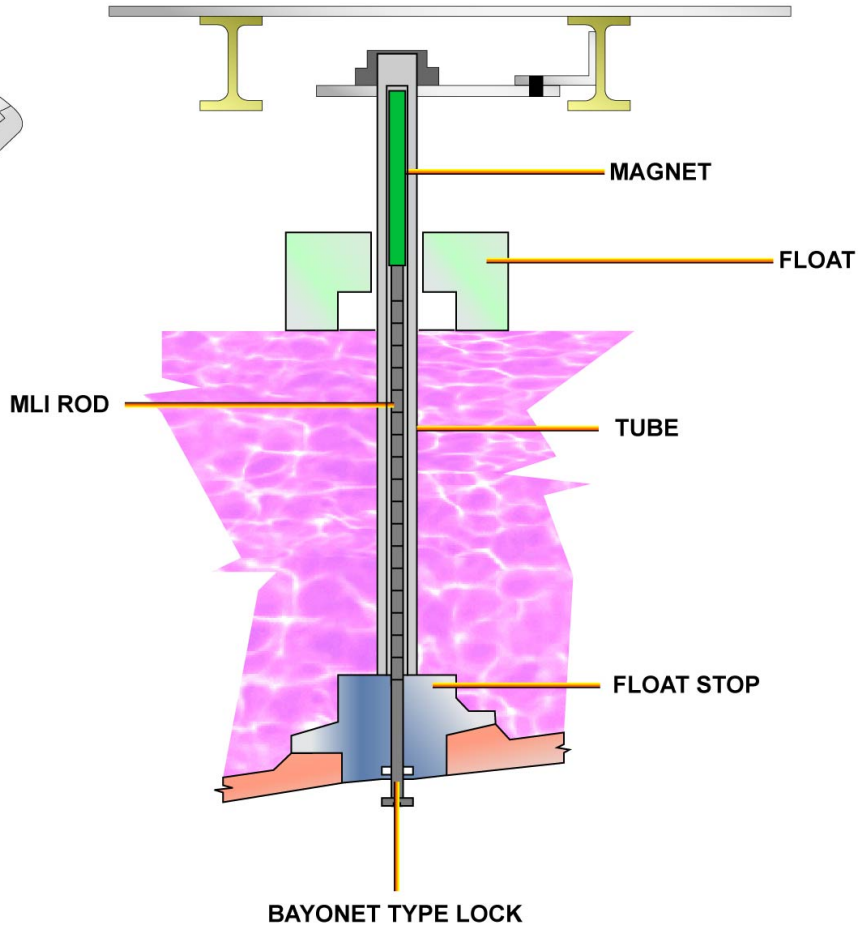
NOTE: Note: Only even number MLI units are listed in the tables. For odd numbers, calculate the volume between the nearest even number in the AMM table

For fuel mass calculation the volume has to be multiplied with the density of the fuel.

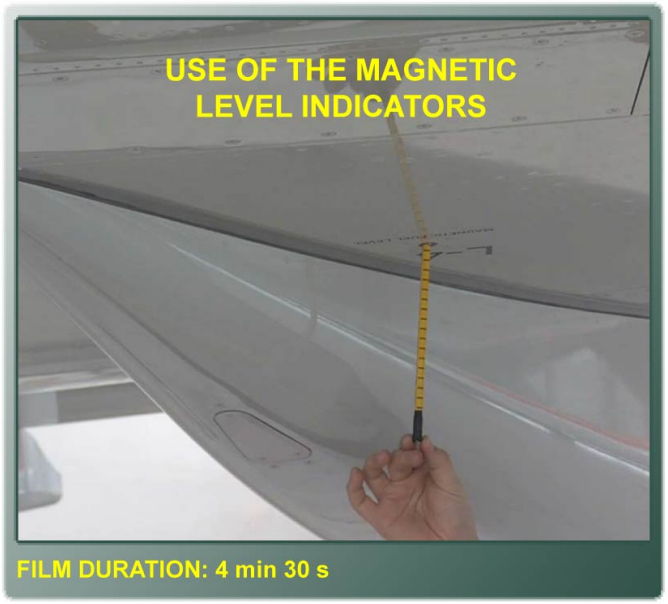
$V(dm^3) \times {}_{Fuel}(kg/dm^3) = kg$

Add together the values for each tank to find the total mass of fuel in the aircraft.




MEL/DEACTIVATION - FUEL LEVEL MAGNETIC INDICATOR




MEL/DEACTIVATION - FUEL LEVEL MAGNETIC INDICATOR

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UGB13131 - U7ST0M0 - UM28BA000000001

# FUEL SYSTEM LINE MAINTENANCE (2)

## MEL/DEACTIVATION (continued)

### METHODS TO DETERMINE A/C ATTITUDE

There are 2 methods to determine aircraft pitch and roll when using the MLI's to calculate fuel quantity. It is possible to use the attitude information generated by the air data system through the Air Data Inertial Reference Unit (ADIRU) or by the fuel system through the Fuel Quantity Indicating Computer (FQIC), FQIS INPUT PARAMETERS page. It is essential to use the correct fuel tables based on aircraft attitude.

The air data inputs to the ADIRU can be read by using the alpha call-up function in the Aircraft Integrated Data System (AIDS). With the ADIRU's in the NAV position, select the AIDS menu in CFDS. From this menu, select CALL UP PARAM ALPHA. To access roll data type ROLL, and to access pitch data type PTCH.

After recording the data, convert the pitch and roll references given to the equivalent grid-square.

For example:

ADIRU PITCH (-1.0) = 2

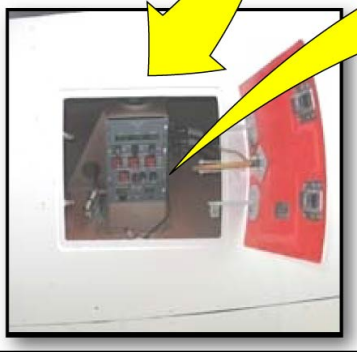
ADIRU ROLL (-0.5) = C

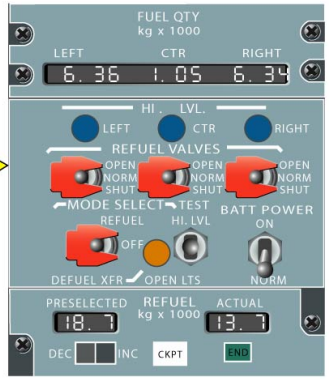
Equivalent Grid-square = C2

The attitude information input to the FQIC may be accessed through the CFDS FQIS INPUT PARAMETERS page. The pitch and roll data can be used from the ADIRU if the data is available. ADIRU data is identified by an 'A' after PITCH or ROLL.

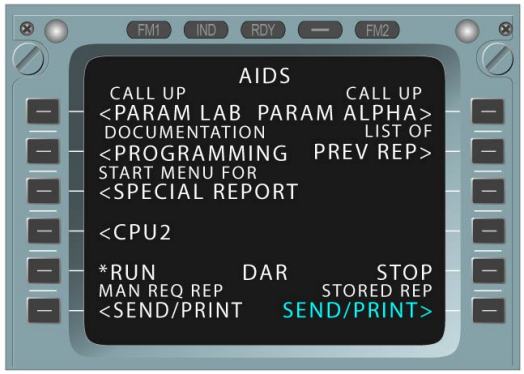
After recording the data, convert the pitch and roll references in the same manner as the ADIRU data above.

UGB13131 - U7ST0M0 - UM28BA000000001

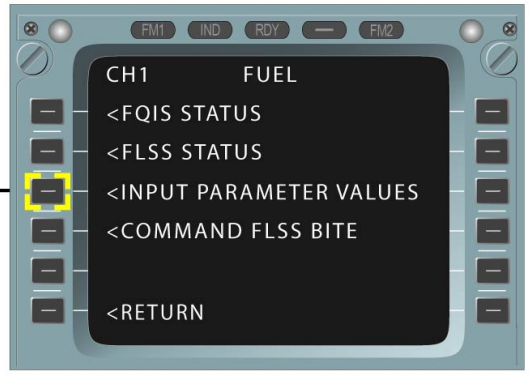


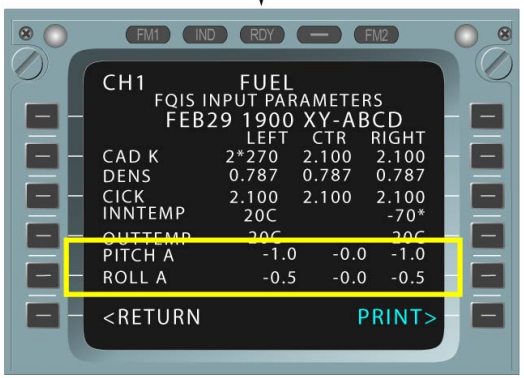



(800VU)




AIR DATA REFERENCE UNIT




FUEL QUANTITY INDICATING COMPUTER

| Pitch | Ref | | Roll | Ref | |
|---|---|---|---|---|---|
| minus | 1.5 | 1 | minus | 1.5 | A |
| minus | 1.0 | 2 | minus | 1.0 | B |
| minus | 0.5 | 3 | minus | 0.5 | C |
| | 0.0 | 4 | | 0.0 | D |
| plus | 0.5 | 5 | plus | 0.5 | E |
| plus | 1.0 | 6 | plus | 1.0 | F |
| plus | 1.5 | 7 | plus | 1.5 | G |

REFERENCE TABLE FROM AMM

MEL/DEACTIVATION - METHODS TO DETERMINE A/C ATTITUDE

# FUEL SYSTEM LINE MAINTENANCE (2)

## MEL/DEACTIVATION (continued)

### FUEL QTY USING MLI

Using the attitude reference from the ADIRU AIDS menu or from FQIC CFDS menu, the MLI number, and MLI reading, find the correct fuel table in the AMM and read the fuel volume. The final step is to convert the volume to mass. Multiply the volume by the fuel specific gravity.
For example with the MLI n°5 in the RIGHT wing
Attitude reference : C2
UNITS reading on the MLI : 10
Volume in liters : 850
Sp. Gravity - 0.81
Fuel mass = 688.5 Kg.

NOTE: Only even-numbered MLI units are listed in the tables. To calculate the volume of fuel for odd numbers, interpolate (divide the difference) between the nearest even numbers in the table.

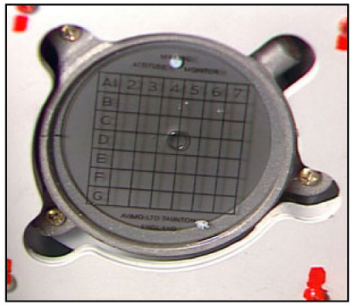
UGB13131 - U7ST0M0 - UM28BA000000001

EXAMPLE

| Pitch | | Ref |
|---|---|---|
| minus | 1.5 | 1 |
| minus | 1.0 | 2 |
| minus | 0.5 | 3 |
| | 0.0 | 4 |
| plus | 0.5 | 5 |
| plus | 1.0 | 6 |
| plus | 1.5 | 7 |

| Roll | | Ref |
|---|---|---|
| minus | 1.5 | A |
| minus | 1.0 | B |
| minus | 0.5 | C |
| | 0.0 | D |
| plus | 0.5 | E |
| plus | 1.0 | F |
| plus | 1.5 | G |

REFERENCE TABLE FROM AMM



ATTITUDE MONITOR
(NOT LONGER INSTALLED ON A/C)

## SAMPLE TABLE FOR DETERMINING FUEL QUANTITY USING MLI's

GRID SQUARE LETTER

GRID SQUARE NUMBER

| UNITS | ATTITUDE MONITOR READING C LEFT WING E RIGHT WING | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 5 | 7 |
| 2 | 700 | 700 | 650 | 650 | 600 | 600 | 600 |
| 4 | 750 | 750 | 700 | 700 | 650 | 650 | 650 |
| 6 | 750 | 750 | 750 | 750 | 700 | 700 | 700 |
| 8 | 800 | 800 | 800 | 750 | 750 | 750 | 750 |
| 10 | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| 12 | 850 | 850 | 850 | 800 | 800 | 800 | 800 |
| 14 | 850 | 850 | 850 | 800 | 800 | 800 | 800 |

| UNITS | ATTITUDE MONITOR READING C RIGHT WING E LEFT WING | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 5 | 7 |
| 2 | 750 | 700 | 700 | 700 | 700 | 650 | 650 |
| 4 | 750 | 750 | 750 | 750 | 700 | 700 | 70 |
| 6 | 800 | 800 | 750 | 750 | 750 | 750 | 750 |
| 8 | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| 10 | 850 | 850 | 850 | 800 | 800 | 800 | 800 |
| 12 | 850 | 850 | 850 | 850 | 850 | 850 | 850 |
| 14 | 900 | 900 | 850 | 850 | 850 | 850 | 850 |

UNITS ON MLI

NOTE FUEL READING ARE IN LITERS

FIGURE 320.1 / 12-11-28-991-038 - FUEL QUANTITY - MLI's STICK N°.5 ATTITUDES C AND E

MEL/DEACTIVATION - FUEL QTY USING MLI

# FUEL SYSTEM LINE MAINTENANCE (2)

## MAINTENANCE TIPS

During a walk-around inspection, it is important to check the burst disc in the OUTER cell. A white cross should be visible on a black background. If it is not visible, it may indicate a problem with the tank venting system.
When aircraft emergency electrical power is used, two wing fuel boost pumps will be supplied, one in each wing. For dispatch per the MEL, both of these pumps must be operational.
According to the AMM, during refueling operations bonding is essential, grounding is recommended. Connect a bonding cable between the fuel tanker and a grounding point on the aircraft, typically on the Nose or Main gear. Connect a grounding cable from a grounding point on the aircraft to the ground.

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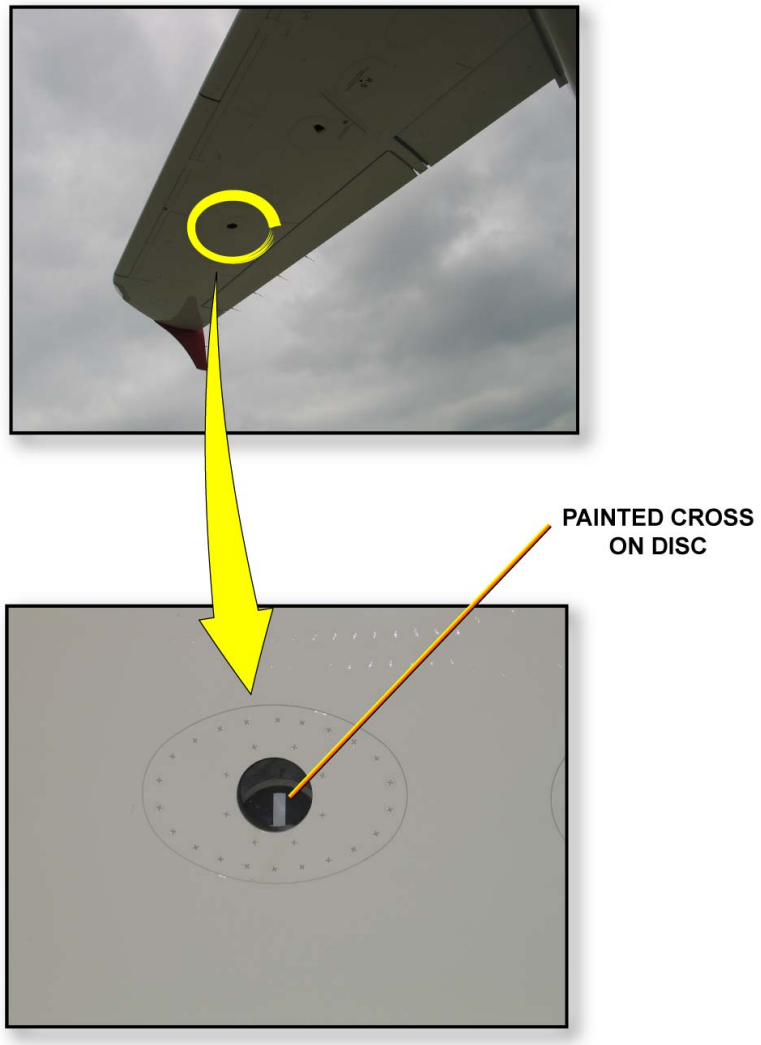


A318/319/320/321
FLIGHT CREW OPERATING MANUAL

| FUEL | 1.28.30 | P 1 |
|---|---|---|
| ELECTRICAL SUPPLY | SEQ 001 | REV 25 |

**BUS EQUIPMENT LIST**

R

| | | NORM | | EMER ELEC | | |
|---|---|---|---|---|---|---|
| | | AC | DC | AC ESS | DC ESS | HOT |
| FQI | CH 1 | | | | SHED | (1) |
| | CH 2 | | DC2 | | | (1) |
| INNER TANK PUMPS | L 1 | AC1 (3) | DC1 | | X (2) (3) | |
| | L 2 | AC2 | DC2 | | | |
| | R 1 | AC1 (3) | DC1 | | X (2) (3) | |
| | R 2 | AC2 | DC2 | | | |
| CTR TK PUMPS (◁) | 1 | AC1 | DC1 | | | |
| | 2 | AC 2 | DC2 | | | |
| CROSS FEED VALVE | MOT 1 | | | | SHED | |
| | MOT 2 | | DC2 | | | |
| ENGINE LP VALVES | ENG 1 MOT 1 | | | | X | |
| | ENG 1 MOT 2 | | DC2 | | | |
| | ENG 2 MOT 1 | | | | X | |
| | ENG 2 MOT 2 | | DC2 | | | |
| XFR VALVES | L 1 | | | | SHED | |
| | L 2 | | DC2 | | | |
| | R 1 | | | | SHED | |
| | R 2 | | DC2 | | | |
| APU | PUMP | | | AC STAT INV or AC ESS SHED | | HOT 1 |
| | LP VALVE | | DC BAT | | | HOT1 |
| REFUEL VALVES | | | DC2 | | | (1) |

(1) HOT BUS supplies power during refueling on battery.
(2) This occurs if DC BUS 1 is lost.
(3) In smoke configuration (GEN 1 LINE pushbutton OFF), inner tank pumps 1 are supplied directly by IDG (instead of AC 1) and pump relays by DC ESS (instead of DC 1).

MAINTENANCE TIPS

*AIRBUS S.A.S.*
*31707 BLAGNAC cedex, FRANCE*
*STM*
*REFERENCE UGB13131*
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